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Manual

of

Genito-Urinary Diseases

by

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Philadelphia

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1899

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To

J. William White, M. D.

Professor of Clinical Surgery in the University of Pennsylvania

In Remembrance of his Kindness and Counsel

By His Friend and Pupil

The Author

Preface.

This little manual has been published in response to the repeated requests of the author's pupils, from notes used by him in teaching and quizzing.

Effort has been made to present the matter briefly and clearly, therefore, authorities have not been cited nor cases quoted, and debatable points have been omitted.

It is believed that the manual will be found abreast of the times and useful to those for whom it is intended.

Ellwood R. Kirby,
1202 Spruce Street.

February, 1899.

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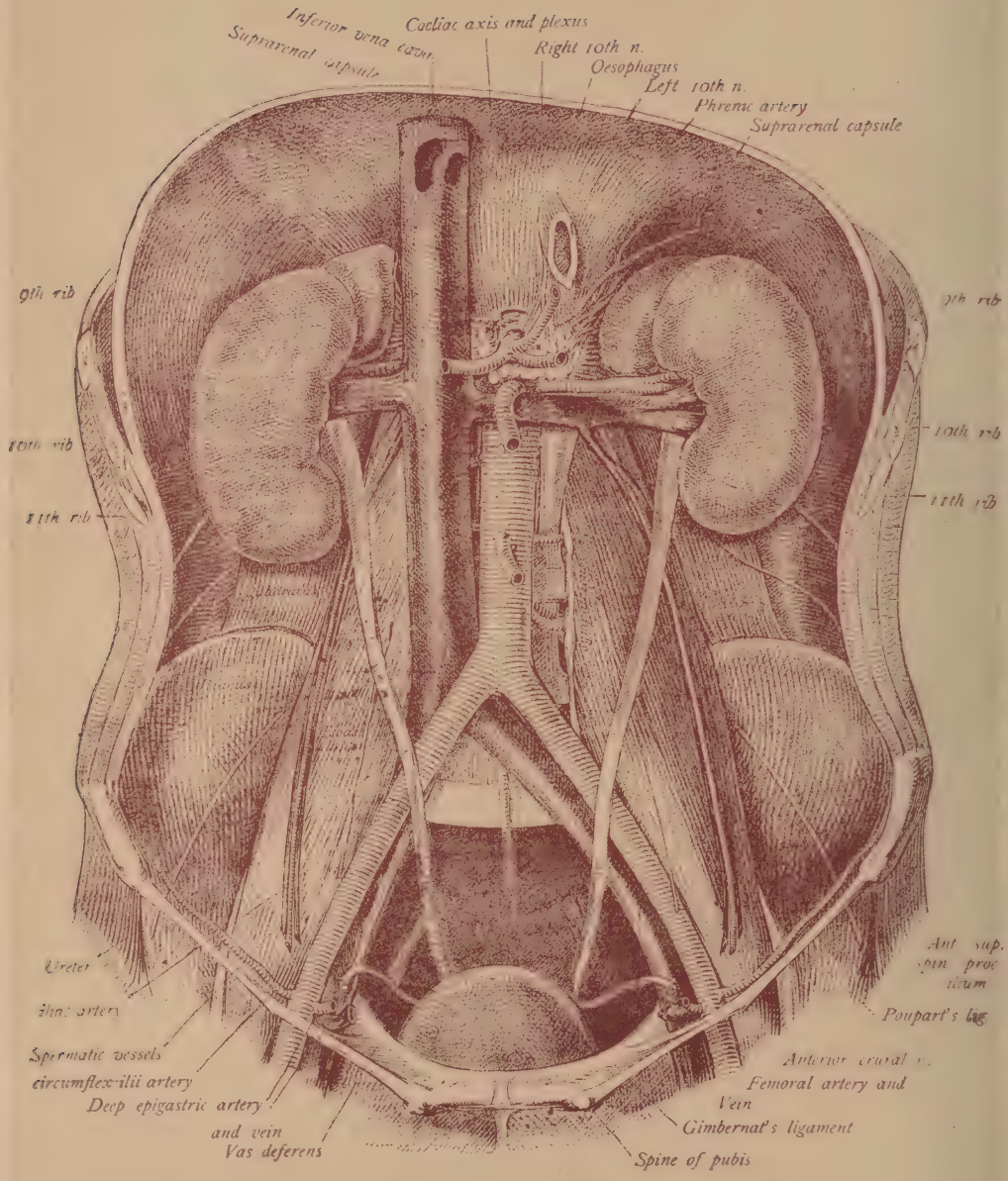


Anatomical Relations of the Kidneys and Ureters.

Diseases of the Genito-Urinary System.

The Kidney.

Anatomy.—The kidneys are situated in the posterior part of the cavity of the abdomen on each side of the lumbar vertebræ. The upper edges of the organs correspond to the space between the eleventh and twelfth ribs, and the lower, to the middle of the third lumbar spine. They are usually imbedded in a considerable quantity of fat, and to it the organs largely owe their fixity of position.

The average measurement of each kidney is about four inches in length, two and a half in its transverse axis, and one inch in thickness; its average weight four and a half ounces. The left kidney is usually a little longer and a little narrower than the right. The renal vessels are about two and a half inches long—the right renal artery being a little longer than the left. The pelvis of the kidney is about two inches from the median line. On the left side, the pelvis of the kidney is opposite the first lumbar spine, while on the right side, it is somewhat lower. The lower end of the right organ reaches to the umbilicus, this being half an inch lower than the left.

Relations.—The kidneys are covered by peritoneum on their anterior surfaces, their posterior surfaces being in relation with the diaphragm, the anterior layer of the lumbar fascia, the psoas magnus muscle, the last thoracic, the ilio-inguinal and the ilio-hypogastric nerves.

The anterior surface of the right kidney is in relation with the inferior surface of the liver, the hepatic flexure of the colon, and the descending portion of the duodenum. Above, it is in relation with the right suprarenal body, which is separated from the pleura by the diaphragm.

The anterior surface of the left kidney is in relation with

the stomach, the tail of the pancreas, the splenic flexure of the colon, a small portion of the spleen, and the splenic artery and vein. Above, it is in relation with the left suprarenal body, which is separated from the left pleura by the diaphragm.

The kidney occupies a space which is represented on the anterior surface of the body by the following measurements: A horizontal line through the umbilicus lies below the lower edge of each kidney; a vertical line carried upwards to the costal arch from the middle of Poupart's ligament has one-third of the kidney to its outer side, and two-thirds to its inner side. (See *Figure 1.*)

To outline the position of the kidneys posteriorly the method of Morris is recommended: Draw a line parallel with, and one inch from, the spine between the lower end of the tip of the spinous process of the eleventh dorsal vertebra and the lower edge of the spinous process of the third lumbar. Now draw a line from the top of this first line outwards at right angles to it for two and three-quarter inches; complete the parallelogram, and the kidney lies within it. (See *Figure 2.*)

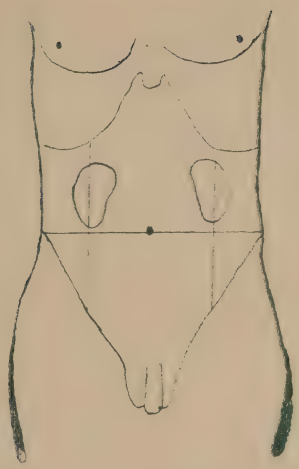
The relative position of the vessels and ureter to each other is as follows: From above downwards—artery, vein, and ureter; from before backwards—vein, artery and ureter.

Anomalies of the Kidney.—There may be more than two kidneys, or there may be congenital absence of one. This latter is a subject of importance, and must be taken into account when nephrectomy is contemplated. The relative frequency being 1 in 3992⅔ cases (Morris).

The kidney may be congenitally enlarged or atrophied, the former condition usually being compensatory in character.

Two kidneys are occasionally found fused into one mass. In the lowest degree of fusion the two organs are united by a flat bridge of connective tissue, while in the higher degrees of the deformity, the bridge consists of true kidney tissue. Morris states that one horseshoe kidney is found in every 1600 cases.

Examination of the Kidney.—With the exception of malignant disease and hydronephrosis but little information can be gained by inspection. By palpation the surgeon may ascertain the



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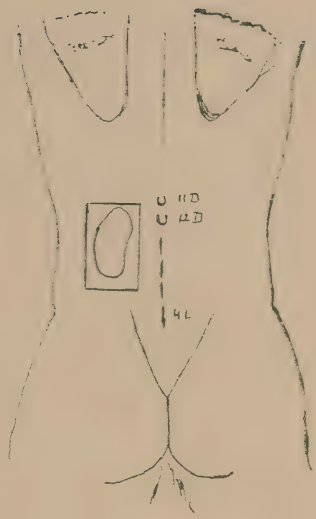

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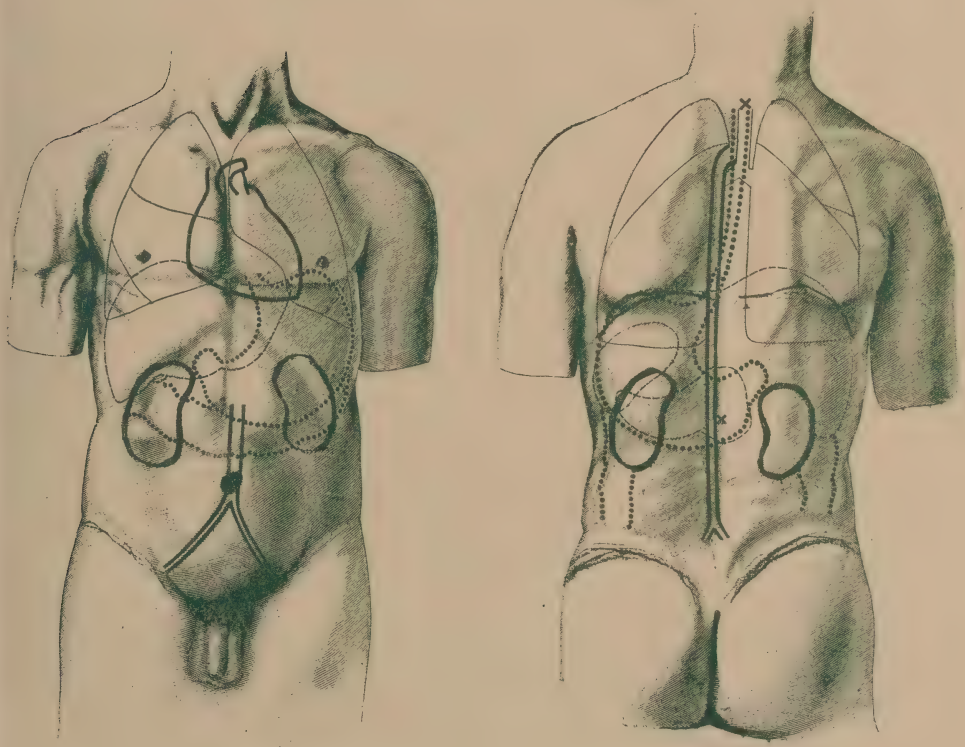


Surface Relations of the Kidneys.

Anteriorly and Posteriorly.

Sympathetic Nervous System.

position, size, mobility, and consistency of the organ. The patient should be placed in the supine position, with the legs flexed on the thighs and the thighs on the abdomen, so as to thoroughly relax the abdominal walls. One hand is placed below the costal margin behind, and to the outer side of the erector spinæ muscle, and pressing up, while with the other hand deep pressure is made during expiration just below the tip of the ninth costal cartilage.

The increase or decrease of resonance over the loin is of questionable value, because in certain positions of the trunk and thighs there is much hollowness in the ilio-costal space. Likewise the mass of muscle and fat in this region often prevents a tympanitic note being elicited.

Examination of the Urine Separately from the Two Kidneys.—The question of the presence of a single kidney must be taken into account when nephrectomy is contemplated. It is likewise necessary, especially in cases of obscure renal disease, to ascertain which kidney is involved.

The urine may be collected separately from each kidney by two methods: (1) Catheterization of the ureters, and (2) Harris's Method.

Catheterization of the ureters is not a very successful procedure in the male, because of the great difficulty in locating the mouths of the ureters. With the cystoscope of Casper the ureteral orifices can be found with comparative ease, but it is exceedingly difficult to introduce the catheter, while with the Brenner instrument the opposite condition of affairs exists.

Harris, of Chicago, has devised an ingenious instrument by which the bladder may be converted into a water-shed or double pouch, and by a special apparatus the urine can be drawn off from each half of the bladder.

The instrument is to be used in the following manner: "The patient, male or female, is placed comfortably on a table in the ordinary lithotomy position, with the hips slightly elevated. The instrument with the flattened surfaces in contact so as to form practically a single catheter, is introduced into the bladder in the ordinary way. So soon as the proximal, curved extremity is within the bladder, the proper distance being indicated by

the scale, each catheter is rotated about its longitudinal axis until each proximal end, as indicated by the distal end, is directed outwards and backwards. They are held in this position by a small spiral spring. The ends of the proximal extremity will now be in the neighborhood of, but not exactly at, the ureteral openings. The ends are separated a greater distance than the distance between the ureteral openings, so as to avoid the danger of compressing the same, and thus preventing the escape of urine. The lever is now introduced into the vagina or rectum, and by gentle pressure forward in the median line, the base of the bladder is raised into a longitudinal fold between the ureteral openings." (See *Figure 3.*)

"The end of each catheter now lies at the most dependent part of a little pocket, a perfect watershed separating the two. The ureters open one on either side of the watershed near the base of the declivity in the immediate vicinity of the respective end of the catheter."

"By producing a gentle exhaustion of the air in the vials by means of the bulb, the urine, as fast as it escapes from the ureters, drops directly into the ends of the catheters and flows at once into the vials, right and left respectively."

Contusions of the Kidney.

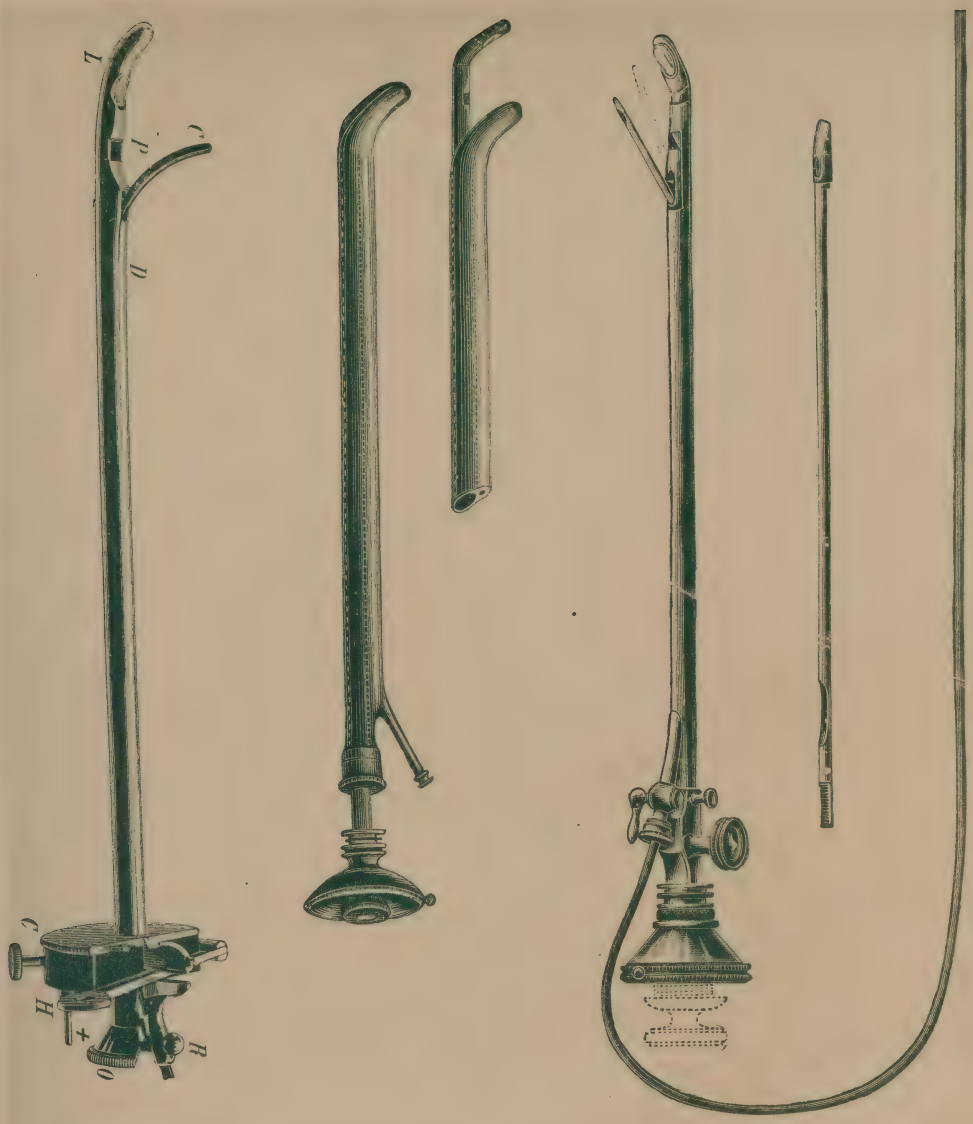
Subparietal injuries are quite common accidents, and vary from the slightest contusion to complete pulpifaction of the organ.

Causes.—Direct violence applied to the lumbar or lateral abdominal regions; sudden and forcible flexure of the trunk, and violent jarring.

Symptoms.—Intense pain in the loin, shooting down towards the testicle or groin; frequent and painful micturition; hæmaturia; rapid forming tumor in the loin (blood and urine); more or less shock, and later ecchymosis.

Hæmaturia is not always present in renal injuries, especially when the ureter is plugged by a clot. Its absence does not preclude the possibility of injury of this organ. There may be no hæmaturia in superficial cortical lacerations.

When the organ has been extensively lacerated, the quantity of blood passed with the urine may amount to many ounces.



Cystiscopes with attachments for Catheterizing the ureters.

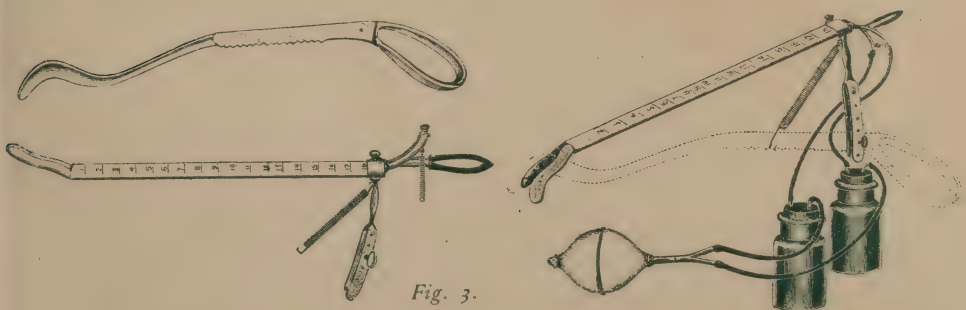


Fig. 3.

Harris's Apparatus.

Blood-supply of the kidneys, bladder, testicles and penis.

In some cases blood may be passed immediately after the accident, and then disappear (plugging of the ureter), to recur a few days later. In other cases, the hæmaturia may be slight at first, and increase later on. According to Rayer the appearance of blood has been delayed until the eleventh day. In complete rupture, blood is frequently absent from the urine.

When the injury of the kidney is associated with other visceral injuries the symptoms may be more or less masked, and unless the pelvis of the kidney is injured, there will be no great amount of urinary extravasation.

Prognosis.—These injuries are exceedingly grave, simple lacerations having a mortality of 43 per cent., and when complicated by injuries of other organs, 87 per cent..

Treatment.—When the symptoms are not pronounced, the patient should be confined to bed; full doses of ergot and gallic acid should be administered internally, and the injured region strapped with adhesive plaster. But small quantities of liquid should be given by the mouth for the first few hours, thirst being relieved by rectal saline injections. All clots should be removed from the bladder with strict antiseptic precautions.

When the symptoms are severe and a tumor is forming in the loin, the kidney should be exposed by a lumbar incision and the injured organ examined. If the laceration be small, it may be sutured with fine catgut; partially-detached portions of the kidney may be excised, while extensive lacerations require complete excision of the organ.

Wounds of the Kidney.

Although exceedingly rare, the kidney may be wounded by either stab or gunshot.

Varieties.—(1) Those involving the posterior surface (extra-peritoneal).

(2) Those involving the anterior surface (intra-peritoneal).

Symptoms.—A wound of the kidney will be indicated by the situation, direction, depth, and immediate consequences of the injury. Blood-stained urine may escape from the wound; hæmaturia may or may not be present; there is often severe pain

in the lumbar region, and moderate shock. When the injury is an intraperitoneal one, the abdomen becomes swollen and tender; there is dulness in the flanks from the accumulation of urine, and death quickly follows from general suppurative peritonitis.

Prognosis.—Uncomplicated wounds of the kidney are usually unattended with danger, as is shown by the uniform recovery after operation. The sources of danger from penetrating renal wounds are (1) hemorrhage, (2) peritonitis, and (3) perinephritis.

Treatment.—If the symptoms are not marked, the wound should be thoroughly disinfected with 1 : 2,000 bichloride solution, packed with iodoform gauze, and an antiseptic dressing, with a pressure bandage applied. When the symptoms are pronounced or the hemorrhage serious, the kidney should be exposed by a lumbar incision, all hemorrhage controlled, and the wound in the kidney treated according to its variety and extent, suture, partial or complete extirpation. For the treatment of intraperitoneal wounds, see wounds of the abdomen.

Movable and Floating Kidney.

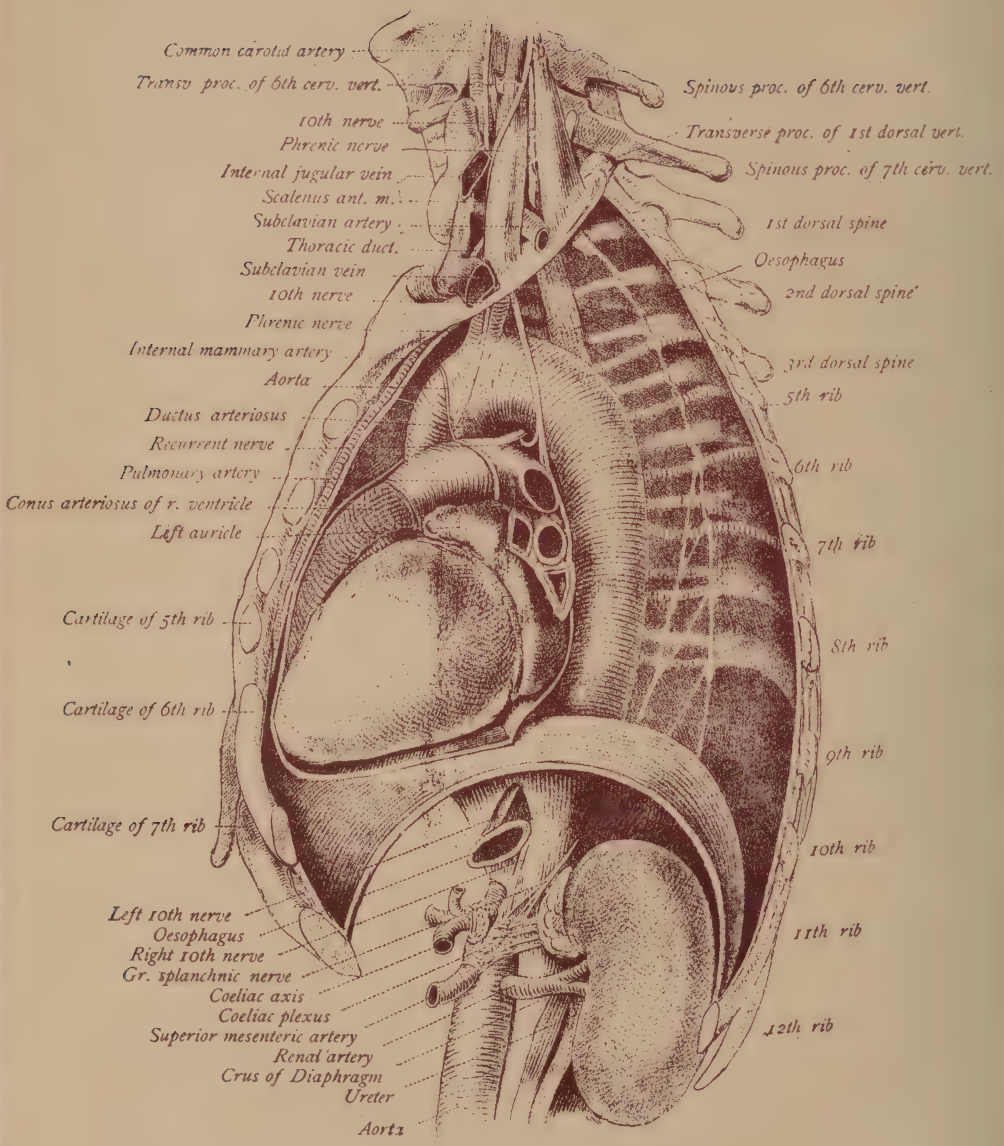
Movable kidney is distinguished from a floating kidney by the absence of a mesonephron, the floating kidney being entirely surrounded by peritoneum (Morris).

Causes.—Floating kidney is always congenital, and is the result of an anomalous attachment of the organ.

Movable kidney may result from injuries, sprains, relaxation following pregnancies, rapid absorption of the fatty capsule in acute wasting diseases, and tight lacing.

Symptoms.—The condition is most common in women, and the right kidney is the one usually affected, because of the liver and the very long renal artery. There is slight uneasiness in the lumbar region; a constant sensation of dragging and weight in the loin; severe paroxysms of pain resembling nephritic colic (twisting of the ureter); vomiting more or less frequent and severe, due to dragging or pressure on the middle portion of the duodenum; loss of appetite, languor, debility, tympanites, and emaciation. These symptoms are aggravated by exertion, fatigue, long standing, etc..

The urine is healthy in character, and, as a rule, is voided



Lateral view of the kidney showing anatomical relations.

in a normal way. In some cases the twisting of the ureter has been followed by the development of a hydronephrosis.

The physical signs, when such exist, are the presence of a movable tumor of characteristic renal outline, which is painful on palpation, or gives rise to a peculiar sickening sensation. Respiration as well as movements of the body influence the positions of the tumor.

When the patient is placed in the supine position, a movable kidney nearly always returns to its place in the loin, while a floating kidney does not.

Diagnosis.—A differential diagnosis is to be made between distended gall-bladder, tumors of the omentum, pyloric tumors, intestinal tumors, and impaction of fæces.

Morris sums up the differential points as follows:

1.—An enlarged gall bladder is a frequent cause of movable abdominal tumor, as well as the kidney.

2.—Inquire if there has been a distinct history of jaundice.

3.—An enlarged gall bladder can invariably be felt, whereas a movable kidney (unless enlarged) cannot.

4.—The fact that the size of the tumor varies from time to time goes for nothing.

5.—A gall bladder with calculi feels much harder than a movable kidney.

6.—The range and character of the mobility:

a. The movements of the gall bladder always takes place in the arc of a circle, the centre of which is a point beneath the edge of the right lobe of the liver. The free and lower extremity can be moved in all directions, but cannot be pushed downwards towards the pelvis, unless the liver as a whole is unduly mobile; it also descends a little on deep inspiration.

b. The kidney, on the other hand, moves bodily from place to place, within the limits of its loose connections. It has a tendency to slip, like a greasy mass, beneath the finger tips, upwards and backwards, into its normal position in the loin, whereas, the enlarged gall bladder, when its free lower extremity is pushed back in the

ilio-costal space behind, has a tendency to spring back again to its position in the front of the abdomen.

Morris states that undue hollowness and resonance with diminished resonance in the loin are unreliable symptoms of movable kidney, because:

7.—In certain positions of the trunk and thighs there is much hollowness in the ilio-costal space when the kidney is in its proper place.

8.—The mass of muscle and fat in this region often prevents a tympanitic note being elicited when the kidney is displaced.

The history of the case, taken in conjunction with the sensations of the patient, when the tumor is manipulated, are important guides in cases of doubt. Pressure on a movable kidney causes a sickening pain which almost produces vomiting.

Treatment.—Many cases are entirely relieved, often permanently, by the use of an appropriate truss or pad. Exercise should be restricted, constipation should be relieved, and the patient placed on a fat-making diet.

When in spite of palliative treatment, paroxysms of nephritic colic, fainting, vomiting, and intense pain still persist, the only possible relief is an operation, stitching the kidney to the abdominal wall (nephrorrhaphy or nephropexy).

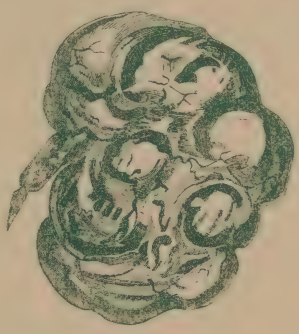
Nephrectomy is indicated when the kidney is diseased as well as movable, provided the other kidney is sound. It may be resorted to after nephrorrhaphy has failed.

Nephrorrhaphy.—An operation for anchoring the kidney to the abdominal parietes.

The patient should be placed in the prone position, with a firm pad or pillow under the lumbar region. An incision is made from the last rib to the crest of the ilium parallel to and along the outer border of the erector spinæ muscle dividing the skin and fascia, the latissimus dorsi, external and internal oblique muscles, and lumbar fascia, exposing the peri-renal fat. This fat is torn through with two pairs of dissecting forceps, while firm pressure on the abdomen by an assistant forces the kidney well up into the wound. Two large retractors are now introduced to separate the edges of the wound, and three sutures of

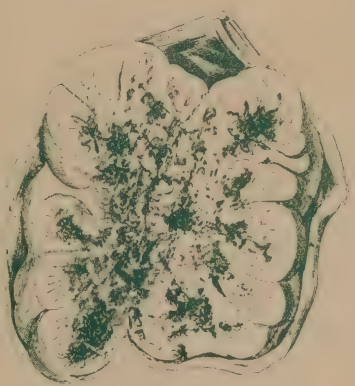
Blood supply of Kidney showing arrangement of Arteries and Veins.

Section of the Kidney in its ungarris.



Cystis of the Kidney.

Dilatation of the ureter from stricture.



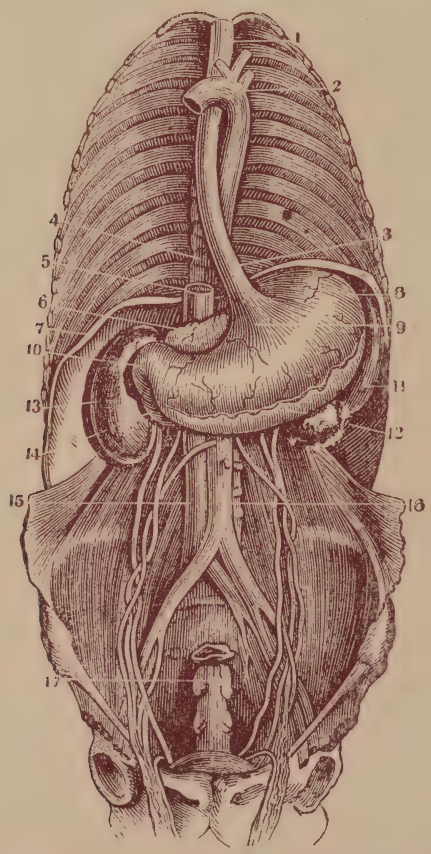
Tuberculosis of the Kidney.

Morris's Operation
for Nephrorrhaphy

Old No. Fig. 4

Vulliet's Operation
Nephrorrhaphy

Old No. Fig. 5



Anatomical relations of right Kidney to the pyloric end of stomach.

heavy chromacized catgut are passed through the organ, about half an inch apart, going well into the substance of the kidney, and then through the adjacent lumbar muscles. These sutures are carefully tied down so as not to tear through the substance of the kidney, and the external incision closed. A pad should be applied to the anterior abdominal region during convalescence to hold the kidney firmly in place while adhesions are forming. (See *Figure 4*).

Tuffier recommends the stripping back of the capsule of the kidney along the intended line of adhesion. Each edge of the capsule is then doubled upon itself and sutured to the subcutaneous structures, thereby increasing the chance of firm adhesion, as Tuffier assumed that the capsule of the kidney would not unite to the surrounding structures, as is supposed to be the case when the usual suture operation is performed.

Vulliet anchors the kidney in place by means of a strip of tendon torn from the erector spinæ muscle, passing through the muscular tissue, and then directly between the cortex of the kidney and its capsule, and then passed back again to be fixed in the erector spinæ muscle at a lower level. (See *Figure 5*.)

Renal Calculus.

Stone in the kidney.

Varieties.—The common varieties, in their order of frequency, are uric, oxalic, and phosphatic.

Causes.—There is usually an excess of urinary salts, induced by sedative habits, overeating, etc., which predispose to catarrhal conditions of the kidney. The epithelial cells, blood-clots, etc., present in catarrhal conditions act as the nucleus about which urinary salts are deposited.

Pathology.—Renal calculi are formed at all periods of life, from the latter weeks of intra-uterine existence up to old age. It is, however, before the age of fifteen and after the age of fifty that calculous affections chiefly occur. In the poorer classes the majority of cases are children; in the better classes they are chiefly persons past middle life. Stone in children is very rare; its prevalence among the poor is explained by Cadge by the absence of milk in their diet.

According to Taylor, renal calculi formed in infancy are composed of urate of ammonium; those of young adult life, uric acid; and after the fortieth year, oxalate of lime.

One or more calculi may be found in the same kidney. When the calculus is composed of oxalate of lime, it is generally single; when of uric acid, it is often single, but is far less likely to be so than when composed of oxalate of lime.

Symptoms.—A stone may form in and escape from the kidney without causing any symptoms. A stone of large size may exist for years without causing any noticeable symptoms.

There is usually a history of repeated attacks of renal colic —violent pain in the lumbar region, which shoots down along the course of the ureter to the end of the penis; retraction of the testicle on that side; vesical irritation and tenesmus, and hæmaturia. The stone may escape into the bladder or go back into the pelvis of the kidney when too large to pass through the ureter.

There is constant pain in the loin, increased by exercise and pressure; occasional hæmaturia brought on by violent exercise; and a temporary hydronephrosis may result from the ball-valve action of the calculus.

Prout states that uric acid calculi produce the least pain, which is of a dull, oppressive character, with a sense of weight; oxalate of lime causes a more acute kind of a pain, referred to a particular spot, while phosphates give rise to a great and unremitting pain, attended, however, with exacerbations.

Hæmaturia is not often profuse or constant, neither is it proportionate to the size, number or chemical nature of the stones. It is not intimately related to pain or to any of the other symptoms. When there is a tendency to hæmaturia it is generally increased by exercise. Calculi composed of oxalate of lime are frequently rough and irregular and are more or less fixed as regards their position. In such conditions hæmaturia as a symptom may be entirely wanting.

The urine in the early stages contains nothing characteristic of calculus; later it may be acid or alkaline, and contain pus, mucus, albumen and casts.

When infection has taken place there is usually some fever of a septic type, with morning remissions, and the patient rapidly loses strength and flesh.

As in the case of other kidney affections, digestive disturbances may be more or less pronounced.

Diagnosis.—A diagnosis must be made from *nephralgia*, *tuberculosis of the kidney*, *malignant disease*, *pyelitis*, *oxaluria* and *spinal caries*.

In *nephralgia* the urine is passed in large quantities, has a low specific gravity, and contains neither pus nor blood. No history of renal colic.

The *symptoms of tuberculosis* in its earliest stages are almost identical with those of calculus. When frequency of micturition and slightly purulent urine are met with in a patient of a tuberculous history, and are unaccompanied by hæmaturia, tuberculosis should be suspected.

Malignant growths are characterized by the presence of a tumor of a rapid growth, with profuse hæmaturia and cachexia.

Oxaluria and strongly acid urine frequently produce symptoms simulating calculus. Such patients who are prone to these conditions are often of the gouty diathesis. The symptoms are not aggravated by exercise, and pressure in the loin does not produce pain, and the symptoms promptly disappear under proper treatment.

Spinal caries of the lower dorsal and upper lumbar vertebræ, when complicated by abscess formation, may simulate renal calculus. The presence of deformity and tenderness over the vertebra will usually indicate the true nature of the trouble.

Expert skiagraphers can now demonstrate the presence of a calculus in all cases.

Treatment.—The *preventive treatment* consists in regulating the diet, white meats, milk, vegetables, etc., regular exercise, and the free use of mineral waters such as Vichy, Carlsbad, and Friedreichschall.

The *curative treatment* consists in the removal of the stone by operation (nephro-lithotomy). Nephrectomy is indicated when calculi are complicated by extensive pyelo-nephritis.

Nephro-lithotomy.—An operation for the removal of a renal calculus.

The patient being placed in the prone position as for nephrorrhaphy, an incision is made parallel to the last rib and half an inch below it, four inches in length, beginning at the outer border of the erector spinæ muscle. The skin and fascia being divided, the latissimus dorsi, external and internal oblique muscles are cut through, exposing the lumbar fascia. After all hemorrhage has been controlled, the lumbar fascia is slit up, and the peri-renal fat exposed. Two large retractors are introduced into the wound, the peri-renal fat torn through with dissecting forceps, the kidney exposed and brought up into the wound. Carefully palpate the kidney and attempt to locate the stone; failing in this, a fine needle may be passed through the substance of the kidney in different directions. When the calculus is located, have an assistant compress the renal artery, and incise the kidney on its convex surface large enough to permit the introduction of the finger for exploration, and removal of the stone.

The calculus is to be removed through this incision, and the patency of the ureter ascertained by the introduction of a ureteral sound. The kidney is now flushed out with Thiersch's solution, and the wound closed with deep catgut sutures, before the assistant releases the renal artery.

The fatty capsule is now partially stitched up, and the kidney anchored to the abdominal muscles, so as to prevent the leakage of urine in the peri-renal space. The divided muscles are closed by catgut sutures, leaving sufficient room for the introduction of an iodoform gauze drain, and close the skin incision with silk-worm gut.

Tuberculosis of the Kidney.

Tuberculosis of the kidney is rarely met with as a primary condition.

Varieties.—(1) *Miliary*, or acute.

(2) *Chronic primary*, (infection through the blood).

(3) *Chronic secondary*, (ascending infection from the bladder.)

The *disseminated or acute* tuberculosis is most common in children before the age of puberty. The *chronic* is most common between the ages of twenty and forty, although it is by no means confined to these limits.

Men are said to be more frequently affected than women. Chronic primary may be unilateral, but later the other kidney is usually affected by the disease ascending from the bladder. In the ascending form, the affection is usually bilateral.

Symptoms.—In the acute miliary variety there are no symptoms referable to the kidney. In the chronic form, there may be *pain* of a dull aching character; increased *frequency of micturition*, and *polyuria*. A tumor may be present in the lumbar region, which may or may not be tender on pressure.

Vesical irritation is a common symptom, and in some cases is most prominent and very distressing.

The urine may not be altered in quantity or character; or it may be excessive in quantity in the early stages; and albuminous, alkaline or acid, containing blood, pus, shreds of tissue, and tubercle bacilli.

As the disease advances, there are marked rigors, exhaustive sweats, hectic fever, emaciation and prostration.

Occasionally an acquired scoliosis may develop to relieve the pressure upon the diseased kidney.

Treatment.—For the acute miliary variety of the disease there can be no treatment. In chronic cases, nephrotomy with drainage is indicated. The question of the involvement of both kidneys must be considered in a nephrectomy. Partial resection of a tuberculous kidney has been performed with complete success.

Hydronephrosis.

An obstruction to the flow of urine through the ureter with a consequent accumulation of urine in the pelvis of the kidney.

(1) Unilateral or bilateral.
(2) Congenital or acquired.
(3) Permanent or intermittent.

Causes.—Ball-valve action of a renal calculus, pressure on the ureter from tumors outside, mechanical twists, and acquired or congenital stricture of the ureter.

Symptoms.—Tumor presenting in the loin or anterior abdomen (not always present); fluctuations in size; when large a small quantity of urine is passed, or an increased amount is passed when the tumor grows small. Fluctuation can occasionally be detected; there is dullness on percussion; a sense of weight and dragging in the loin, with paroxysmal attacks of colicky pain.

Treatment.—Massage along the course of the ureter may be tried. A ureteral bougie may be passed from the bladder up when a stricture exists. The tumor may be aspirated when of large size and urgent symptoms are present. Nephrotomy should be done as a final measure, but a permanent fistula usually results. When the kidney substance is destroyed from long-standing pressure, a nephrectomy is indicated.

Pyelonephritis.

A suppurative inflammation of the kidney and its pelvis.

Causes.—It may be secondary to renal calculus; it may follow a septic inflammation of a hydronephrosis; it may be the result of ascending infection from the urethra and bladder, and may complicate typhus, typhoid, diphtheria, and pyæmia.

The colon bacillus is the organism usually found in these cases.

Symptoms.—Chill, fever (103° to 105°), intense pain in the loin; headache; somnolence; nausea; dry, brown tongue, and emaciation.

The urine is often purulent and acid at first, while later, it may be phosphatic and alkaline. In many cases the amount of urine secreted is increased, and the quantity of urea excreted decreased. Hyaline, granular, and even pus casts may be found.

Diagnosis.—Pyelonephritis is to be distinguished from acute Bright's, pyæmia, septicæmia, typhoid fever, malaria, and uræmia.

From acute Bright's, by the absence of convulsions, œdema, the urine being abundant and purulent.

From pyæmia, by the absence of metastatic abscesses, and the characteristic chill, fever, and sweat.

From septicæmia, by its less rapid course and by

the absence of that restless anxiety and delirium which accompany the prostration in septicæmia.

From typhoid fever, the history and the course of the disease, and the absence of typhoid stools, will usually be sufficient.

From uræmia the diagnosis is much more difficult, because in some of the fatal cases of urinary fever there is complete suppression of urine for some hours before death.

Catheterization of the ureters or the use of the Harris's apparatus give absolutely diagnostic results in these cases.

Treatment.—In the early stages, the patient should be confined to bed, dry cups or hot fomentations applied over the kidneys, and the free use of milk and spring water. In later stages, nephrotomy is indicated.

Pyonephrosis, or Surgical Kidney.

An accumulation of pus in the pelvis of the kidney secondary to pyelitis with blocking of the ureter.

Causes.—Same as for pyelonephritis.

Symptoms.—Moderate fever of an irregular type; pain and tenderness in the loin; gradual tumor formation, which increases and decreases in size, with a corresponding increase or decrease of pus in the urine; obscure fluctuation, and dullness on percussion.

The pain experienced, depends largely upon the size of the tumor; there are, in some cases, paroxysms of great severity.

The urine contains pus, sometimes blood, and is always alkaline and phosphatic.

Diagnosis.—According to Rayer, the tumors which may be mistaken for pyonephrosis are: On the left side of the abdomen, all those which result from morbid enlargements of the spleen; on the right side the tumors of the liver and gall-bladder; on either side the various renal tumors of another nature, such as hydronephrosis and malignant disease, etc.; from caries of the spine, tumors of the suprarenal capsule, aneurisms of the aorta, and impactions of fæces.

Treatment.—*Massage* along the course of the ureter may

be tried. Failing in this *nephrotomy* should be done, the incision being made through the convex surface of the kidney, and the edges sutured to the abdominal incision. *Nephrectomy* may be indicated when the kidney is completely disorganized and the disease unilateral.

Perinephritic Abscess.

A purulent inflammation of the peri-renal cellular tissue.

Causes.—Traumatism with pyogenic infection. It may be secondary to suppurative diseases of the kidney.

Symptoms.—Chill, fever (103° to 105°), profuse sweating, coated tongue, vomiting and delirium. Obstinate constipation is a very frequent symptom, and is probably due to the dread on the part of the patient of employing muscular effort.

Pain is one of the earliest and most prominent symptom. It is usually centred about the loin or lateral abdominal region, and sometimes shoots down towards the groin.

There is a sense of increased resistance in the loin followed by tumor formation, redness and œdema of the skin.

Diagnosis.—Differential diagnosis must be made from lumbago, nephralgia, spinal caries, appendicitis and empyema.

Lumbago is unaccompanied by local swelling, or by very marked tenderness; the pain is experienced on both sides of the spinal column, does not extend around the front of the renal region, nor shoot to the groin or testes. There is also no flexion of the thigh nor lateral inclination of the trunk as in perinephritic abscess.

In *nephralgia* the pain is periodic, paroxysmal, and variable in degree; it is generally increased by fatigue or nervous depression; it is unattended by alteration in the urine, and does not often shoot along in the direction of the ureter.

In *spinal caries* the pain extends around the trunk, and is often most felt over the pit of the stomach; it is relieved by suspending the patient. There is no inclination, nor rotation of the trunk, and the flexibility and mobility of the spine is lost.

In *appendicitis* the characteristic symptoms are pain, tenderness and swelling in the right iliac fossa, while in perinephritis they are chiefly in the ilio-costal space behind.

Empyema is to be recognized by its usual symptoms.

Treatment.—A free incision must be made in the lumbar region over the most prominent part of the tumor, and the pus allowed to escape. The abscess cavity must be thoroughly disinfected with bichloride solution 1 to 2,000, packed with iodoform gauze, and the whole covered with a large antiseptic dressing.

The kidney should always be examined for suppurative conditions and appropriate treatment instituted.

Tumors of the Kidney.

Malignant tumors are more common than benign.

Varieties:

1. Primary
   - A. Benign.
     - *a.* Fibroma.
     - *b.* Myxoma,
     - *c.* Lipoma.
     - *d.* Angioma.
     - *e.* Adenoma.
     - *f.* Strumal lipomatodes aberratæ renis.
   - B. Malignant
     - *a.* Carcinoma
       - encephaloid.
       - scirrhus.
     - *b.* Sarcoma
       - congenital, rhabdomyoma.
       - acquired, angiosarcoma.
2. Secondary
   - *a.* Sarcoma.
   - *b.* Carcinoma.

Renal tumors are among the most difficult of abdominal enlargements to diagnose correctly.

According to Morris, the chief distinctive points about tumors of the kidney are as follows:

(1) The colon is in front of the tumor. Bowel is never placed in front of a splenic tumor, and but rarely in front of one of hepatic origin.

(2) There is no line of resonance between the kidney dullness and the vertebral spines; and no space between the kidney and the spinal groove into which the fingers can be dipped, as there is between the spleen and the spine.

(3) Renal tumors do not project or protrude backwards to

any marked extent, but enlarge in front, while abscess and other lesions often occasion considerable posterior projection.

(4) The kidney is rounded laterally, rounded at its inner border, rounded at its upper border, and rounded at its lower border. The inner border is usually lost against the spine, and the upper border cannot be felt unless the kidney is displaced.

(5) Renal less frequently and less markedly than hepatic and splenic enlargements descend in inspiration, kidney swellings being often quite fixed in their position.

(6) When the pelvis of the kidney is dilated the resulting tumor may press upon the liver so as to be indistinguishable from it. As a rule, renal enlargements do not invade the pelvis, rarely reach the median line, and frequently are separated from the hepatic dullness by a resonant area.

(7) When the tumor is large enough to reach the anterior abdominal wall, the most anterior part is commonly about the level of the umbilicus or a little higher.

Symptoms of Malignant Disease.—Presence of a tumor smooth or lobulated, hard, soft, or fluctuating; asymmetry of the abdomen when the tumor is large; pain varies from a dull ache to sharp paroxysmal attacks simulating renal colic, and is due to the passage of blood-clots.

Hæmaturia is present in about one-half of the cases; it may appear early or late, may be intermittent, and either profuse or microscopical. Sometimes it is brought on by exertion, otherwise it is apparently causeless.

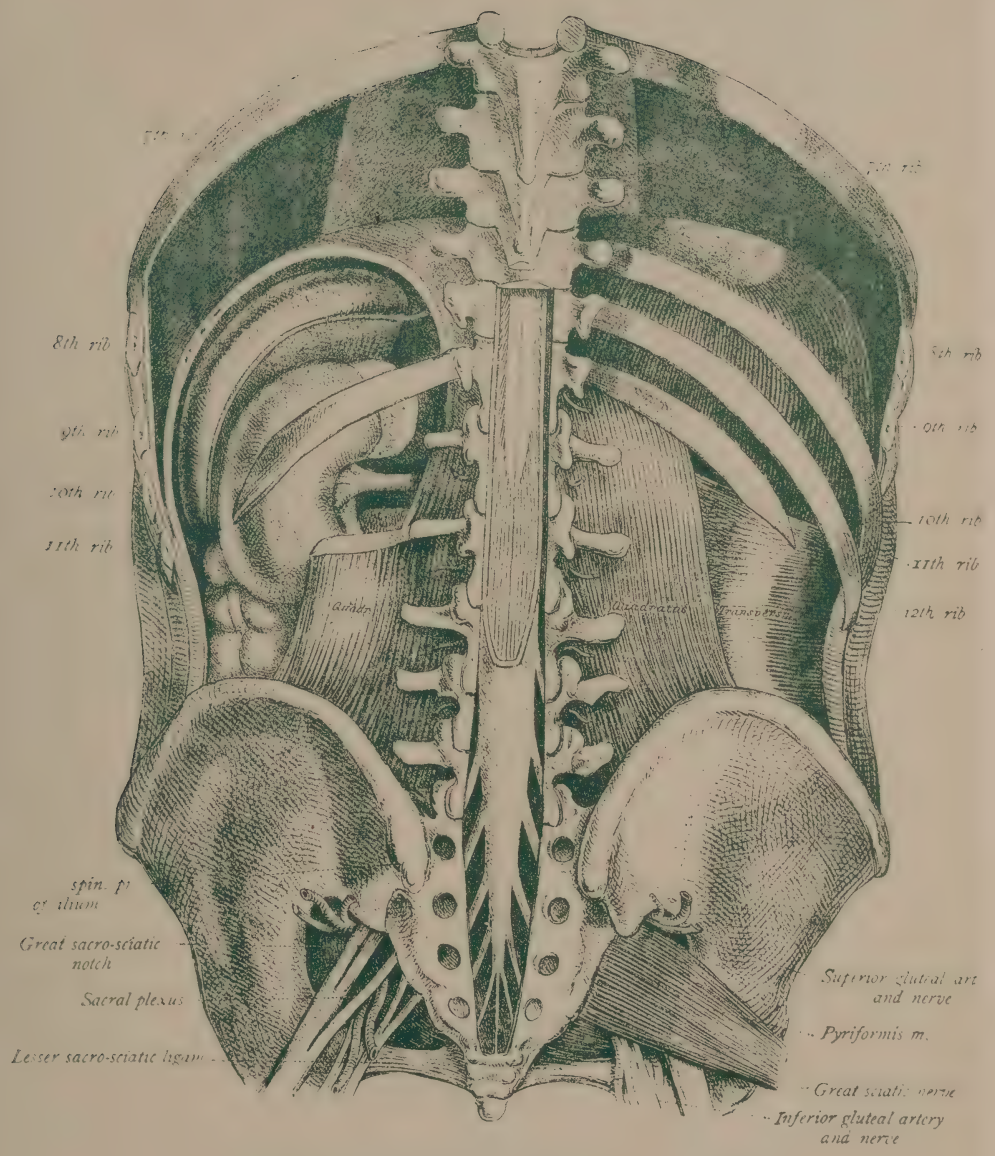
As the disease advances digestive disturbances become marked; there is deficiency in the amount of urine excreted, ascites, emaciation, and cachexia.

Prognosis.—Malignant disease of the kidneys is not so rapidly fatal as when other organs are involved. Death is frequently the result of pulmonary embolism.

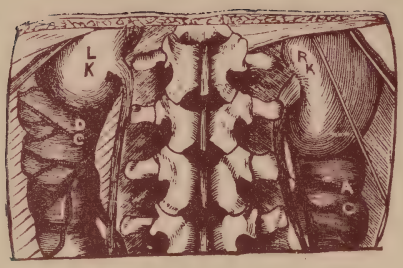
Treatment.—Nephrectomy is indicated when the cases are seen early.

Nephrotomy.

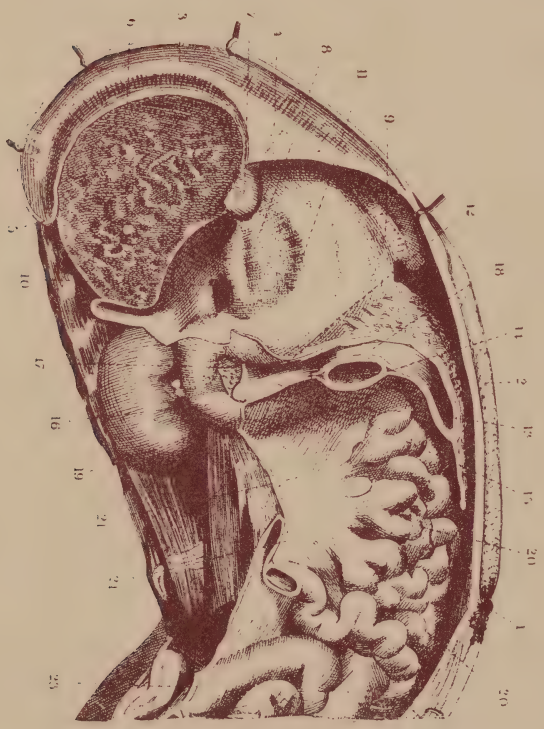
An incision into the kidney.



Anatomical relations of the Kidneys posteriorly.



Anatomical relations of the Kidneys and Colon.



Lateral view of relations of the Kidney and pyloric end of Stomach.

Indications.—Pyelitis, pyelonephritis, pyonephrosis, tuberculosis, and hydronephrosis.

Operation.—The technique of this operation is the same as nephrolithotomy, and has been sufficiently described.

Nephrectomy.

Extirpation of the kidney.

Indications.—Certain cases of tuberculous pyelitis; calculous pyelitis; pyonephrosis; some cases of hydronephrosis; malignant disease and certain injuries.

Operation.—(*Lumbar method.*)—The position of the patient and the earlier steps are much as those already given in the account of nephrolithotomy. When the lumbar fascia has been slit up and the peri-renal fat torn through, the kidney is pulled up into the wound, retractors are introduced and a clamp applied to the pedicle. The kidney is now removed and each vessel tied separately, the stump of the ureter being cauterized with pure carbolic acid to prevent infection of the wound.

When the usual lumbar incision is found to be too small for the removal of a large kidney, *Kœnig's incision* may be employed. An incision is made from the last rib along the outer border of the erector spinæ to the crest of the ilium, and then curved towards the umbilicus, ending about the outer border of the rectus abdominalis.

When the kidney is very large, especially in cases of malignant disease, the anterior abdominal incision or that of *Langenbuch* is to be preferred. An incision is made, at first, four inches in length, commencing just below the ribs in the line of the linea semilunaris, and the abdominal cavity opened. The incision being enlarged towards Poupart's ligament when necessary, and any intestines turned to the opposite side, and kept out of the way by the use of gauze pads. The outer or posterior layer of the meso-colon is torn through and all hemorrhage at once arrested. After the kidney is freed from adhesions, the pedicle is clamped with forceps, the organ removed, and the stump treated in the same manner as for the lumbar operation.

The tear in the posterior peritoneum is closed with fine catgut sutures, and the abdominal incision closed. When necessary, drainage may be provided for by making a counter opening through the loin.

The Ureter.

Anatomy.—The ureters are musculo-membranous tubes from fourteen to sixteen inches in length, about the size of a goose-quill, and placed entirely behind the peritoneum. The ureter rests from above downwards upon the psoas muscle and the genito-crural nerve; the common iliac vessels on the left side, and the external iliac on the right; it then enters the posterior false ligament of the bladder to reach the bladder wall. The narrowest part of the tube is the portion within the bladder walls, calculi being often arrested at this point.

Subcutaneous Rupture of the Ureter.

Causes.—Traumatism, the rupture being usually situated about the brim of the pelvis.

Symptoms.—Similar to those of rupture of the kidney, but the onset is not so rapid.

Treatment.—As soon as a diagnosis can be made, incision and drainage should be carried out either through the lumbar region or by the transperitoneal route.

The continuity of the tube should be restored by Van Hook's method. (See *Figure 6.*)

Wounds of the Ureter.

Exceedingly rare, but may be either stab or gunshot.

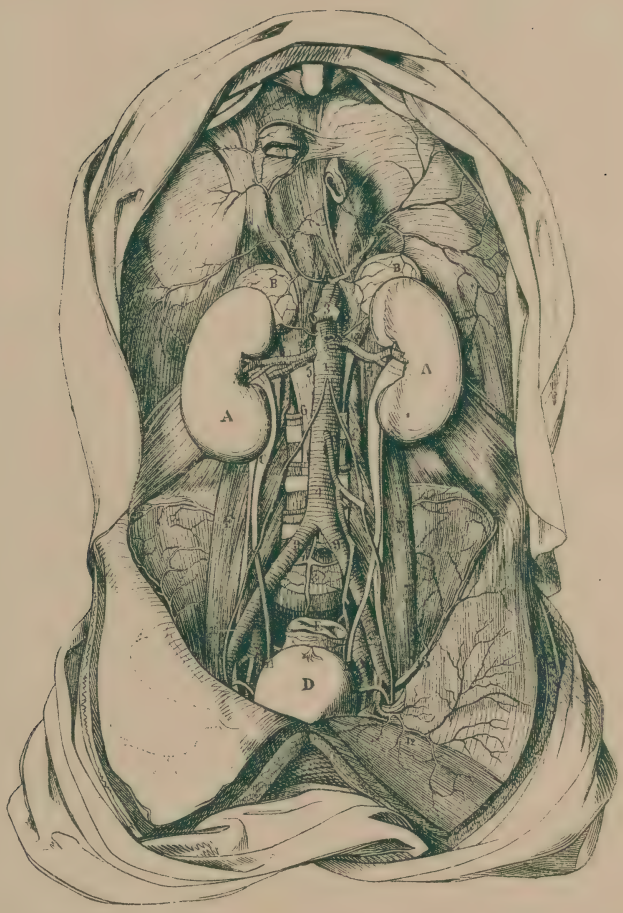
Symptoms.—These injuries are difficult of diagnosis unless urine escapes from the wound.

Treatment.—Same as for rupture.

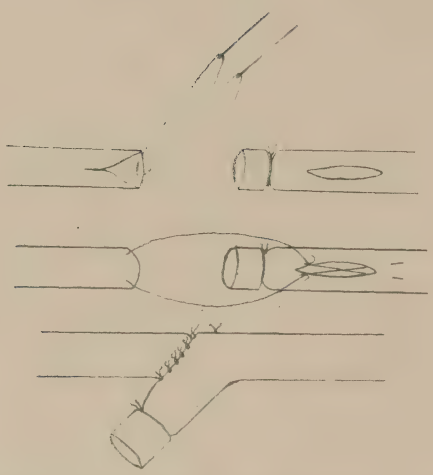
Ureteritis.

Inflammation of the ureter.

Causes.—(1) Extension of disease upwards from the bladder.
(2) Extension downward from the kidney.
(3) Impacted calculi.
(4) Tuberculosis.

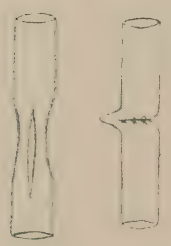


Abdominal aorta and its branches. 1, 1, trunk of abdominal aorta; 2, 2, inferior diaphragmatic arteries; 3, cœliac artery; 4, origin of superior mesenteric; 5, 5, renal arteries; 6, 6, spermatic arteries; 7, inferior mesenteric artery; 8, middle sacral; 9, 9, primitive iliacs; 10, 10, external iliacs; 11, 11, internal iliacs; 12, epigastric artery; 13, circumflex iliac; 14, 14, middle suprarenal. A, A, kidneys; B, B, suprarenal capsules; C, C, ureter; D, bladder; E, rectum; F, F, psoas muscles.



Van Hook's operation for Ureteral Anastomosis (Utererorraply).

Old No. Fig. 6.



Fenger's operation of Ureteroplasty for stricture.

Old No. Fig. 7.

Symptoms.—Indefinite, and often masked by the prominent symptoms of the primary infection. There may be pain along the course of the ureter, frequent and painful micturition, with pus and blood in the urine.

Diagnosis.—The diagnosis can usually be made by a cystoscopic examination of the ureter or by using Harris's apparatus.

Treatment.—Purely expectant. When possible, the ureter should be catheterized and then irrigated with nitrate of silver 1 : 10,000, or 1 : 50,000 bichloride solution. Bad cases may require nephrectomy.

Uteral Calculus.

When a stone escapes from the pelvis of the kidney it may lodge in the ureter at one of the normal points of narrowing, the most common point being the posterior false ligament of the bladder.

Symptoms.—Repeated attacks of renal colic; secondary development of a hydronephrosis, pus and blood in the urine. The X-Ray has been successfully used in these cases.

Treatment.—Uretero-lithotomy.

Ureteroplasty.

A plastic operation for the relief of stricture. (See *Figure 7.*)

Uretero-lithotomy.

An operation for the removal of a stone from the ureter.

The ureter may be reached by Israel's incision—a point just below and then parallel to the last rib, then down towards the centre of Poupart's ligament, and then along the border of the rectus. Occasionally the stone may be pushed into the bladder or crushed between padded forceps.

Ureterectomy.

This operation is occasionally necessary in tuberculosis, and it requires at the same time a *nephrectomy.*

The operation can be satisfactorily performed through Langenbuchs' incision for nephrectomy. It may be done by the extraperitoneal route, the incision eight or ten inches in length along outer border of the erector spinæ just above the crest of the ilium, then parallel to it, and then obliquely downward towards the symphisis pubes.

Uretero-Ureterostomy.

An operation for uniting a ureter to that of the opposite side (See Van Hook's method—*Figure 6*).

Uretero-Enterostomy.

An operation for the implantation of the end of a divided ureter into the bowel.

Uretero-Cystostomy.

The implantation of the ureter into a new position in the bladder.

Ureterorrhaphy.

An operation for the approximation of the ends of a divided ureter.

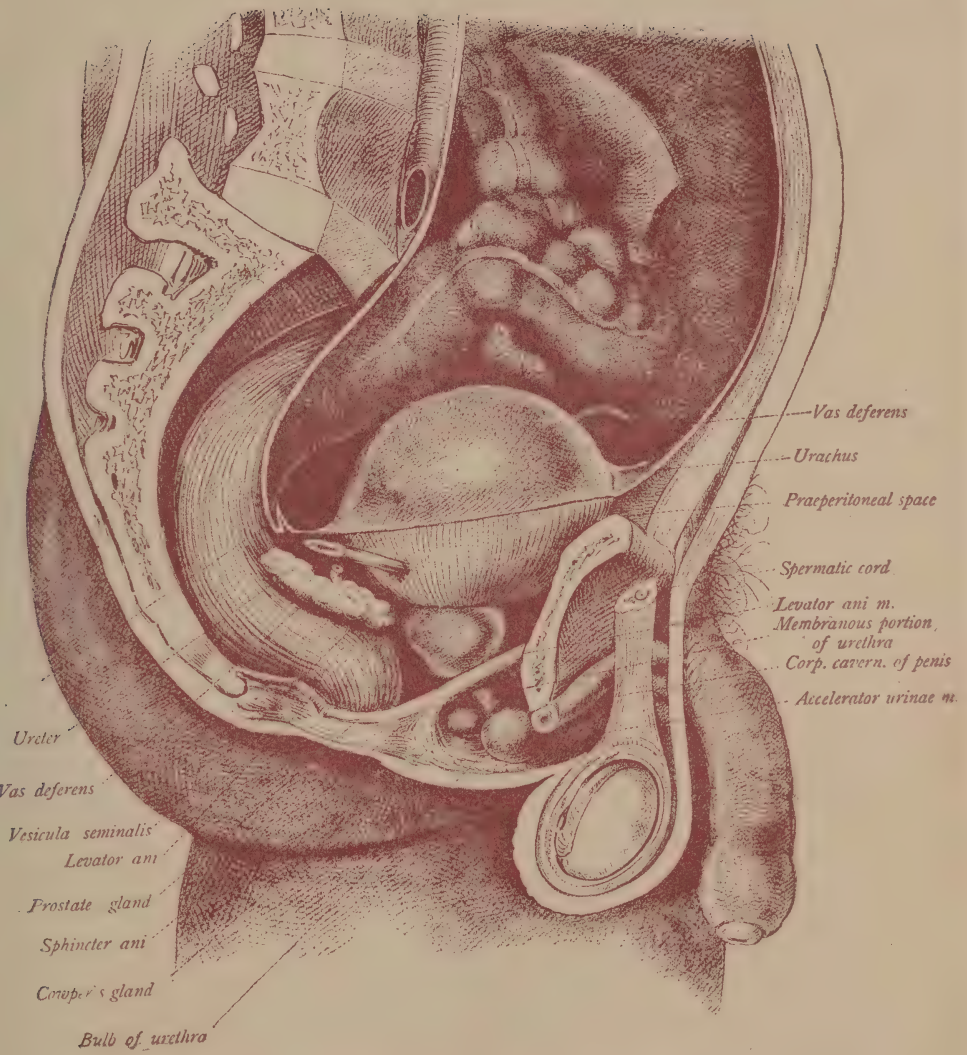
Van Hook's Method.—The free end of the peripheral stump is closed by a ligature. One-quarter of an inch below the ligature, a longitudinal incision is made through the entire thickness of the wall of the ureter. The proximal end is then cut oft obliquely, and split down the side. Two catgut sutures are introduced through the proximal end, and then into the distal end, so that the end of the ureter is brought inside the longitudinal incision. A few catgut sutures then hold it in place.

This is a much better operation than the simple end to end method, because the latter operation is apt to be followed by stricture. (See *Figure 6.*)

The Bladder.

Anatomy.—The bladder is a musculo-membraneous pouch, triangular in shape, and rests against the anterior wall of the pelvis. The usual capacity of the organ is about one pint, but when distended may hold some quarts.

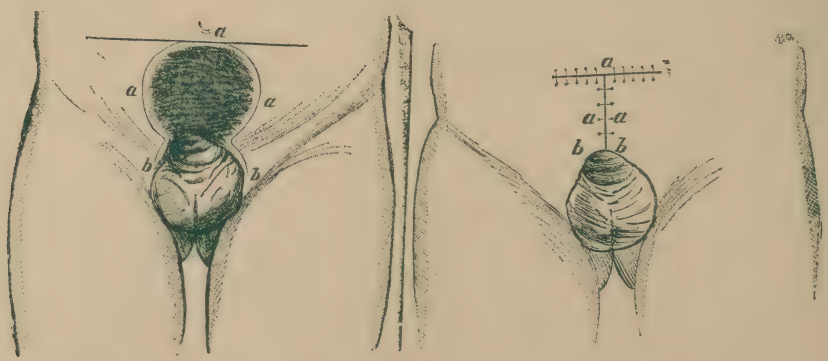
The anterior surface of the bladder is in relation with the symphisis, being separated from it by a small space which is occupied by areolar tissue; this is known as the space of Retzius. When the bladder is distended this space is pushed upward and lies between the bladder and the lower portion of the abdominal wall, giving an area through which operations on the viscus



Anatomical relations of the Bladder showing arrangement of its peritoneal covering.

Exstrophy of the Bladder.

Wood's operation for Exstrophy of the Bladder.



Bigelow's operation for Exstrophy of the Bladder.

may be performed without injuring the peritoneum. When the fundus of the organ is midway between the symphisis and the umbilicus, there will be some two inches of the anterior abdominal wall in the median line uncovered by peritoneum. The posterior surface of the bladder is covered by peritoneum and, in the male, is separated from the anterior wall of the rectum by coils of small intestines, which occupy the recto-vesical pouch of the peritoneum.

Exstrophy of the Bladder.

A vice of conformation due to failure to close of the allantois, characterized by the absence of the anterior vesical and part of the abdominal walls, a separation of the symphisis pubis, and an epispadic condition of the penis.

Cases of marked exstrophy are often associated with double inguinal hernia, or undescended testicle.

The protruding mucous membrane being exposed to the friction of the clothing, and to the action of the air and decomposed ammoniacal urine, is the seat of a chronic catarrhal inflammation.

Treatment.—The *mechanical treatment* consists in the use of appropriate apparatus to prevent the leakage of urine, and at the same time, collect it in a suitable reservoir.

The *radical treatment* aims to close the defect by some form of plastic operation.

Wood's Operation.—A cutaneous flap of sufficient size to cover in the defect is turned down from above, the hair follicles being destroyed, so as to prevent the growth of hair into the bladder. This flap is then reflected with the skin surface down and sutured to the freshened edges of the defect. (See *Figure 8.*) Two triangular flaps are now dissected from the region of the groin, the raw surfaces of which should cover the raw surfaces of the first flap. These should be sutured together in the medain line, and the defects left by the dissection of the flaps are closed as far as possible with suture.

Trendelenberg secured primary union of the freshened edges of the cleft by first dividing the sacro-iliac synchondrosis. By entirely freeing these joints an approximation of at least two inches between the anterior superior spines of the ilium may be gained. This preliminary operation, however, is not devoid of risk.

Maydl resects the entire bladder and transplants the ureters into the colon.

No single plan of operation will meet the requirements of every case; failures are common, and the course of treatment often extends over a period of two or more years.

Cystocele.

A hernia of the bladder. It usually appears in the inguinal region.

Symptoms.—A swelling appears in the inguinal region, dull on percussion, fluctuating in size according to the amount of urine passed, and when fluids are injected into the bladder the tumor increases in size.

Treatment.—Any of the radical operations for inguinal hernia may be done, as a truss is not well borne.

Hæmaturia.

Blood in the urine.

Causes.—(1) *Kidney*—congestion, contusion, embolism, thrombosis, inflammation, Bright's disease, rupture, wounds, tumors, and certain drugs as cantharides and turpentine.

(2) *Ureter*—wounds, rupture, stricture, impacted calculi, and tumors.

(3) *Bladder*—cystitis, calculus, tuberculosis, tumors, rupture, and wounds.

(4) *Urethra*—rupture and acute inflammations.

In hemorrhage from the kidneys and ureter unless excessive, the blood is intimately mixed with the urine, imparting to it a smoky appearance.

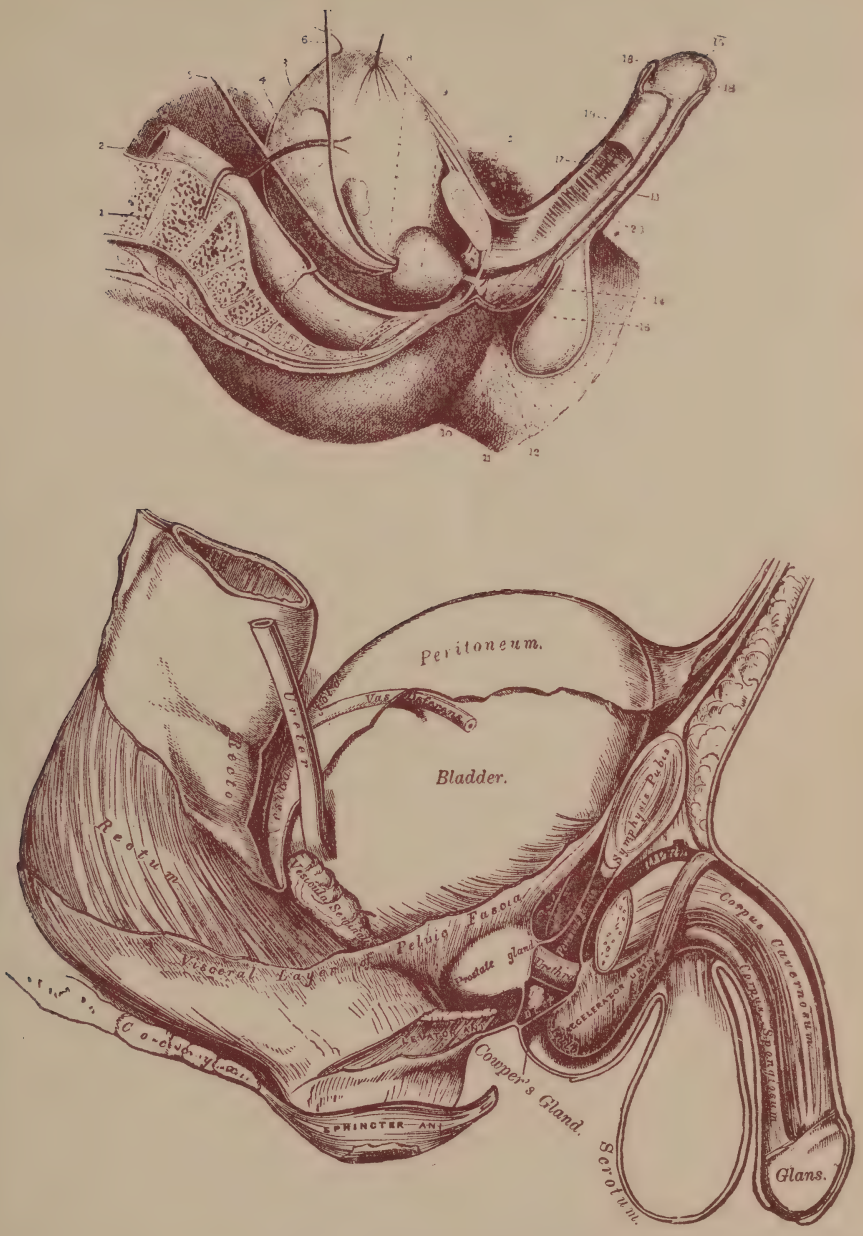
In hemorrhage from the bladder, the urine is passed first and the blood last.

In urethral hemorrhage, the blood escapes first and the urine passes clear afterwards.

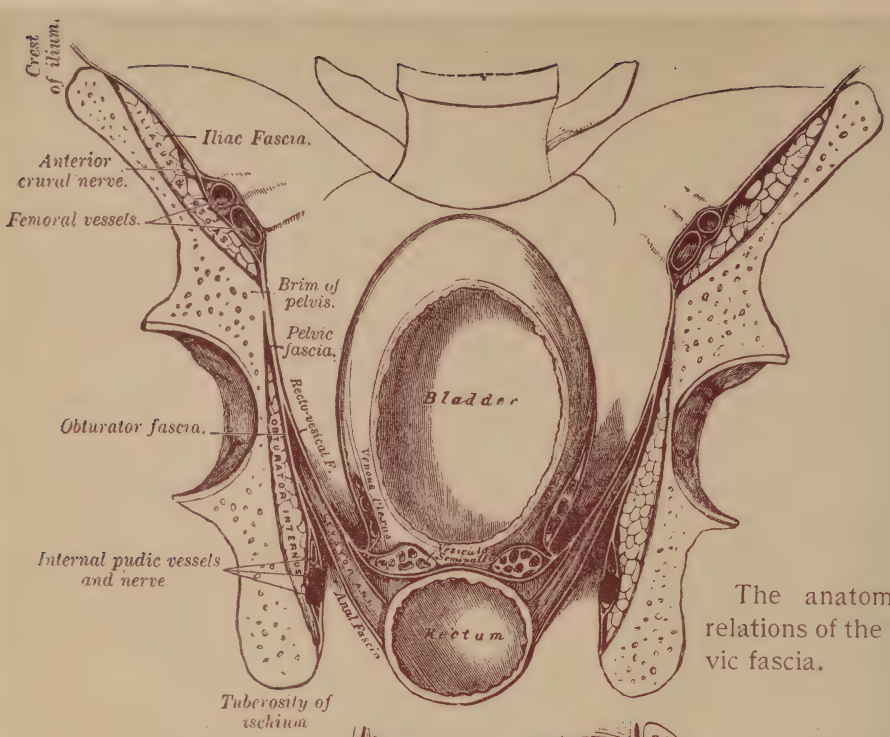
Treatment.—For treatment, see special headings.

Frequency of Micturition.

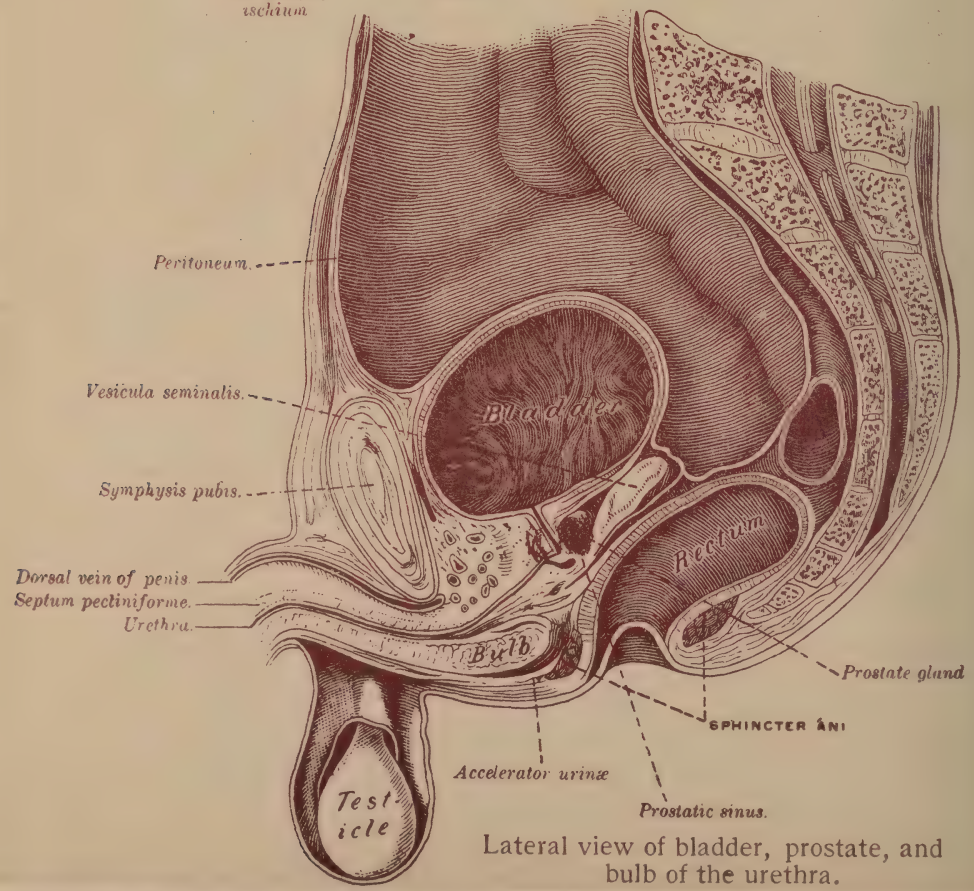
The bladder under ordinary circumstances is emptied in the early morning, after breakfast, about noon, towards evening, and before going to bed, passing in all from fifty to sixty ounces.



Lateral view of Pelvis, showing anatomical relations of bladder, seminal vesicles, ureter, vas, prostate gland and pelvic fascia.



The anatomical relations of the pelvic fascia.



Lateral view of bladder, prostate, and bulb of the urethra.

The term *"irritability of the bladder"* is understood to mean that the act of micturition is performed unnaturally often, that is, a person is in some manner inconvenienced by the frequency with which the act is performed.

Causes.—Irritability of the bladder is traceable to one or other and sometimes more than one of the following conditions: Nervousness, habit, diet (beer and tea), seasons (winter), certain drugs, diabetes, structural changes along the genito-urinary tract; tumors, calculi and abnormal states of the urine. (See Special Diseases of the Genito-urinary tract).

Treatment.—The treatment of irritability of the bladder is founded on the detection and removal of the cause (see special headings).

Many cases exist without any apparent cause, and for them the following prescription will be found of great value:

℞. Tincturæ belladonnæ . . ƒʒi
Acidi boracici . . .
Sodii bromidi . . āā ʒii
Liq. potassi citratis q. s. ad ʒvi
M. S. ƒʒss every four hours.

Some cases do well on small doses of hyoscine 1/240 of a grain thrice daily, especially when associated with hyperæsthesia of the prostate.

The bowels should be kept regular, and such general measures adopted as will build up the general tone of the individual.

Residual Urine.

That urine which remains in the bladder after each act of micturition, and cannot be passed by voluntary efforts on the part of the patient.

Causes.—Enlarged prostate, vesical tumors, and tight strictures. In enlarged prostate, owing to its attachment to the posterior layer of the triangular ligament, it must grow backwards, carrying with it the neck of the bladder and forming a pouch. The same condition of affairs results from the presence of a vesical tumor. In stricture of the urethra, residual urine results from chronic over-distension, and atony of the bladder.

Treatment.—Careful catheterization with strict antiseptic precautions one-half as many times in every twenty-four hours as there are ounces of residual urine.

Suppression of Urine.

A condition in which the kidneys fail to secrete or the ureters are blocked; in either case uræmia promptly develops.

Retention of Urine.

Inability to expel urine from the bladder either from obstruction or atony.

Causes.—(1) *Obstructive* — urethral stricture, hypertrophy of the prostate, impacted urethral calculus, tumors of the urethra and bladder, congenital adhesion of the præputial orifice, fæcal impaction, rupture of the urethra, and foreign bodies.

(2) *Atonic* — paralysis (disease or injury), shock, certain drugs (belladonna, opium, and cantharides), weakness from low fevers, and over-distension.

(3) *Spasmodic*—operations upon the spermatic cord, testicle, or rectum.

Symptoms.—Gradually forming hypogastric tumor; dullness on percussion; fluctuation; the desire to urinate is urgent; history of the inability to urinate; distress, and great anxiety.

If the retention is unrelieved in acute cases, the patient must die of uræmia, or in very exceptional cases from rupture of the bladder.

When the retention is more gradual in its onset, pathological lesions result, which, although not immediately serious, are disastrous and widespread in the ultimate. The bladder walls may be either preternaturally thinned or greatly hypertrophied; this is followed by dilatation of the ureters and pelvis of the kidney, and finally complete destruction of kidney substance.

Treatment.—See special headings.

Incontinence of Urine.

A condition in which the urine constantly dribbles away from the patient. It is subject to great variations; the urine may escape as fast as it is secreted, or may be retained until several

ounces accumulate, and then be discharged drop by drop or in a feeble stream (incontinence of retention).

Causes.—(1) *Traumatic*—incontinence may follow operations upon the bladder, as for stone, or from a recto-vesical or vesico-vaginal fistula; injuries of the lumbar and sacral region, and from caries of the vertebræ (lumbar region).

(2) *Mechanical*—hypertrophy of the prostate, too frequent use of large bougies over-dilating the vesical neck, and occasionally tumors of the bladder, especially when seated at the vesical neck.

(3) *Chemical*—alteration of the chemical composition of the urine is a frequent cause of incontinence, especially when intensely acid or containing oxalates.

(4) *Inflammatory*—posterior urethritis, prostatitis, cystitis, and tubercular ulcerations of the bladder.

(5) *Reflex*—contracted prepuce, chronic balano-posthitis, rectal irritation from worms or polypus, and masturbation.

Treatment.—Remove the cause whenever possible, such as all sources of irritation, anatomical defects, etc.. Internally strychnia, belladonna, or hyoscine may be tried.

In cases of incontinence of retention, catheterize three or four times daily with strict antiseptic precautions.

Atony of the Bladder.

A paralysis of the detrusor muscles, so that the bladder is unable to contract and expel its contents.

Causes.—Senility, enlarged prostate, vesical tumors, and over-distension.

Symptoms.—Frequency of micturition and residual urine.

Treatment.—Regular catheterization half as many times daily as there are ounces of residual urine with strict antiseptic precautions. The bladder may be irrigated daily with cold boracic acid solution for its tonic effect. Electricity may be tried, and the internal administration of strychnia should always be employed.

Catheterization.

The introduction of a catheter into the bladder for the purpose of removing its contents or for irrigation.

Varieties of Catheters.—(1) Nelaton's or flexible soft rubber; (2) flexible woven olivary; (3) flexible woven conical; (4) Mercier's elbowed and double elbowed; (5) flexible woven cylindrical; (6) metallic, and (7) full-curved metallic prostatic. (See *Figure 9*).

Sterilization of Catheters.—The exposure of urethral instruments to formaldehyde vapor given off by paraform in a closed box at ordinary room temperature proves absolutely efficacious. By this means, new catheters which are always infected, and even old instruments which have been dipped in decomposed urine, are rendered absolutely sterile.

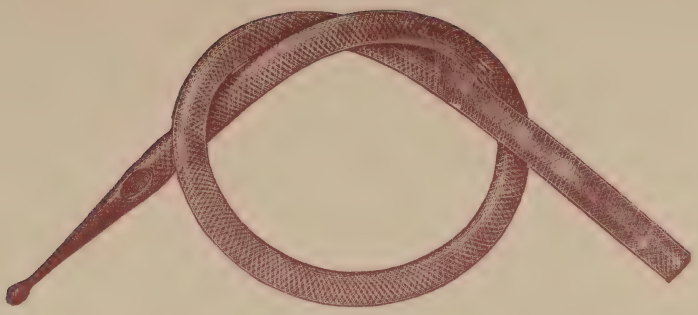
All that is required to sterilize rubber catheters is a metal box which must be in a measure air-tight, containing perforated trays on which the catheters can be laid, and with a tray provided with a gauze screen on which the paraform can be spread so that vaporization may be fairly rapid. The catheters must be exposed to the fumes of the drug for at least twenty-four hours, so that the surgeon should constantly have in the box exposed to the gas, twice as many catheters as are required for use in one day.

Technique of Catheterization.—The catheters having been thoroughly sterilized, the next point to be considered is the maintenance of this condition until they have been introduced into the bladder.

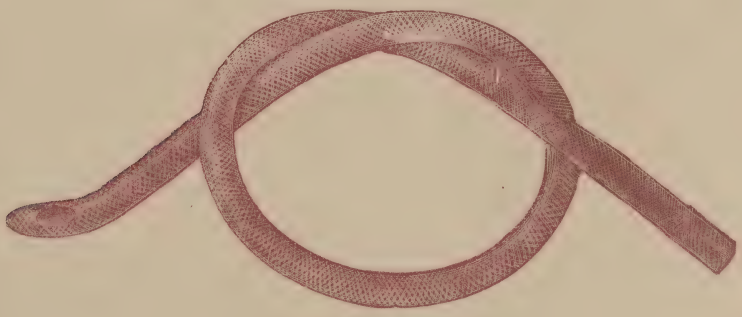
In order to catheterize successfully the surgeon should make use of skin-tight rubber gloves sterilized by immersion in 1 to 20 carbolic acid solution, thus avoiding the discomfort and irritation that follows the frequent cleansing of the hands.

As a lubricant, a 25 per cent. solution of boroglyceride to every six ounces of which a half a drachm of pure carbolic acid has been added, is to be preferred. Such a solution is not irritating and can be readily washed off, thus facilitating the subsequent cleansing of the instrument. When oils are used the irrigating fluids cannot penetrate the grease so as to disinfect the urethral mucous membrane.

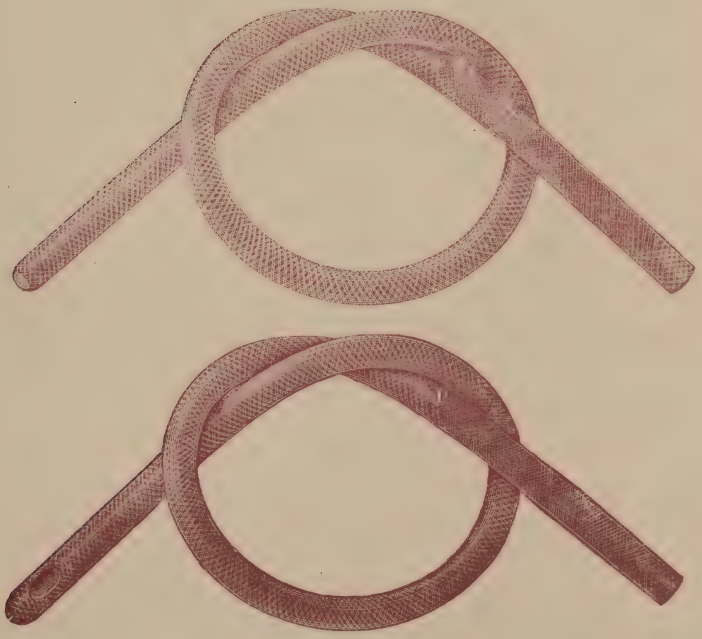
The penis is now pulled through a hole in the center of a sterilized towel so that the surrounding field of operation may be rendered clean. The meatus and glans penis should be



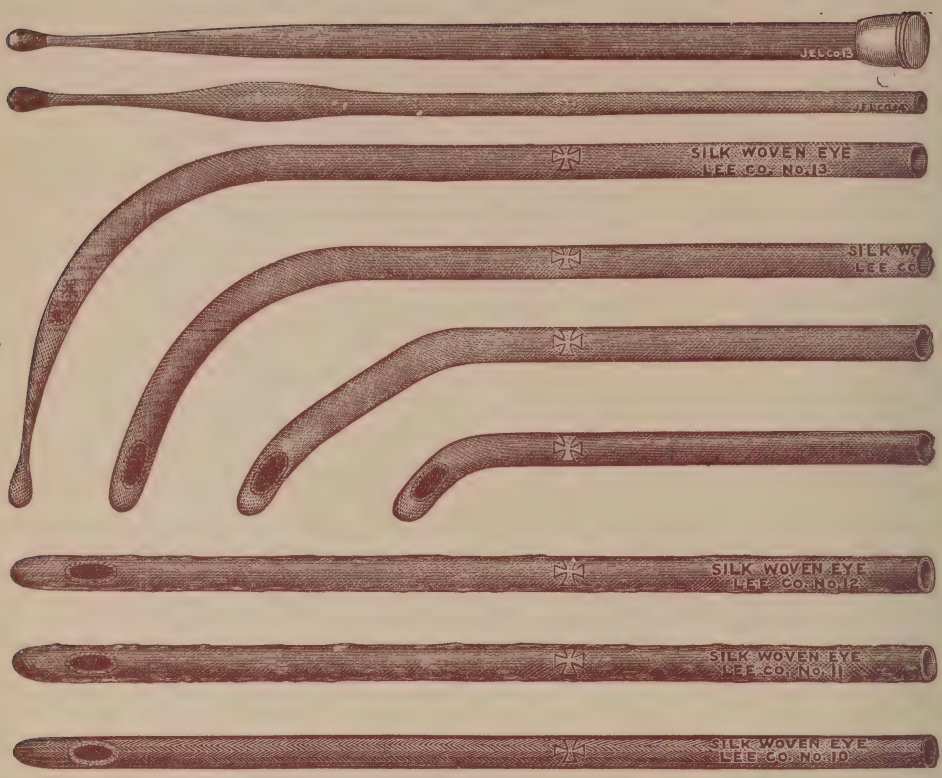
Olivary Catheter.



Mercier's Catheter.



Straight French Silk Catheter.



Soft Catheters.

Pocket-Case Metal Catheters.

Soft and metallic Catheters.

Old No.—Figure 9

rubbed with a gauze pleget wet with alcohol, and finally with one wet with 1 to 1000 bichloride solution.

The normal urethra contains on all occasions germs of more or less virulence, so that it is necessary to first irrigate the urethra with some antiseptic solution before passing the catheter into the bladder. A sterile soft catheter is then attached to the tube of the irrigating bag, and the instrument introduced slowly while a stream of 1 to 5000 nitrate of silver solution is allowed to flow through its lumen until the catheter reaches the neck of the bladder; then the stream is shut off, the catheter pushed forward until the eye reaches the bladder, the urine allowed to escape, and as the catheter is withdrawn it is again connected with the irrigating bag and the silver solution allowed to escape from the urethra behind the catheter. After the operation the instrument is washed with soap and warm water, particular attention being given to the cleansing of the interior of the catheter; it is finally rinsed in boracic acid solution, dried with a sterile towel and then replaced on the lower tray of the paraform box. This same technique must be repeated at each seance.

Cystitis.

Inflammation of the bladder.

Varieties.—Acute and chronic. They may be subdivided into purulent, catarrhal, pseudomembraneous, hemorrhagic, gangrenous, and painful.

Causes.—(1) *Predisposing*—such conditions as favor retention of the urine and chronic congestion; in short, any condition that would favor irritability of the bladder.

(2) The *exciting* causes are gonorrhœa, acute infectious fevers, introduction of dirty instruments and descending infection from the kidney. The colon bacillus is the organism most frequently found.

Pathology.—The changes which are produced by acute cystitis are increased vascularity of the mucous membrane, with, here and there, patches of ecchymosis. The mucous membrane is swollen, softened and sometimes ulcerated.

The inflammation may involve all coats, and may even extend to the peri-vesical cellular tissue, occasioning by the interstitial infiltration marked thickening or suppuration in and about the walls of the bladder, together with peritonitis.

In chronic cystitis the mucous membrane is thickened owing to the organization of the inflammatory exudate and forms ridges which may be felt by instrumental exploration. As a result of the excessive irritability the muscles become hypertrophied, forming large bands between which the mucous membrane may bulge, producing a condition known as sacculation.

Symptoms.—Pain in the hypogastric region increased by motion and pressure; increased frequency of micturition, worse when the patient is in the erect posture, attended with pain and vesical tenesmus. The bladder becomes exceedingly intolerant to the pressure of the urine, which is expelled in small quantities, but without affording any feeling of relief.

The urine becomes scanty, at first acid, and high colored, then cloudy, and containing pus, blood, mucous, and vesical epithelium.

The irritability of the bladder often becomes so intense that the last drops of urine are tinged with blood.

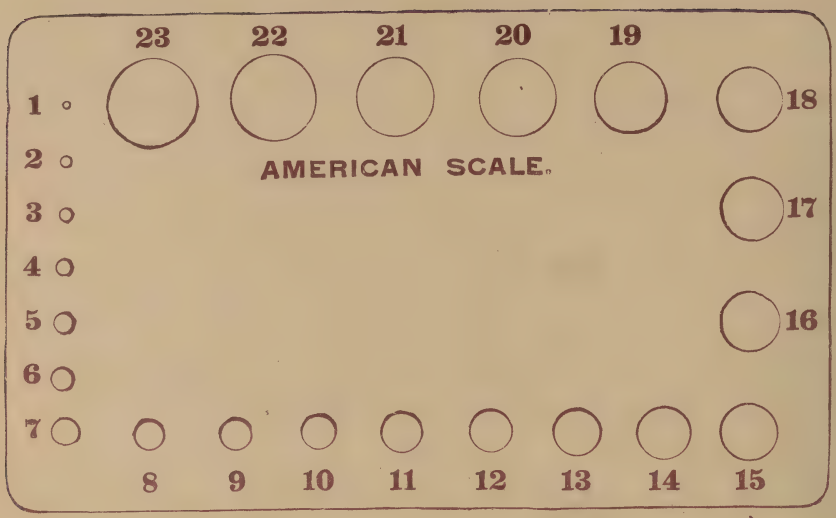
The urine is cloudy at the end of urination.

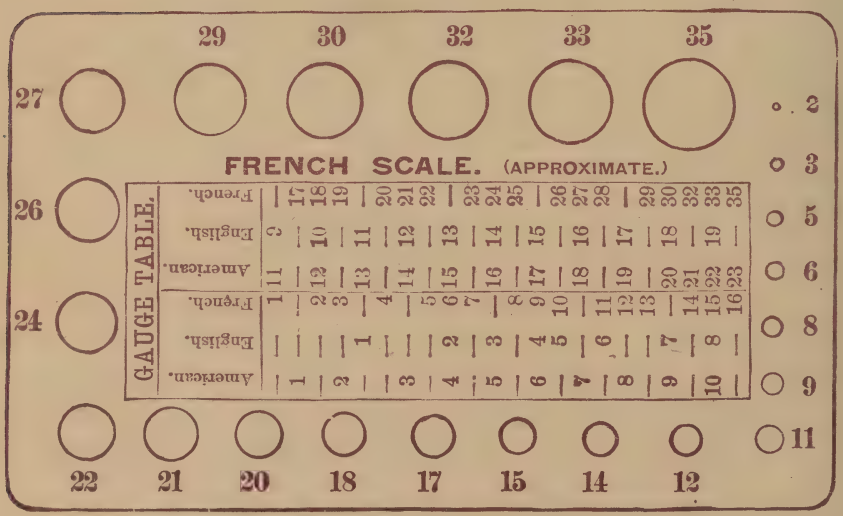
When cystitis arises as a complication of gonorrhœal infection, the disease is confined chiefly to the neck of the bladder.

The constitutional symptoms are indicated by the rapid pulse, fever (102° to 103°), thirst, headache, nausea, with great restlessness and mental anxiety.

Diagnosis.—Cystitis of the neck of the bladder may be confounded with prostatitis.

Prostatitis	Cystitis
1. Pain chiefly referred to perineum and anus.	1. Pain referred to the hypogastrium.
2. Pain is violent and throbbing.	2. Pain is constant and diffuse.
3. Stream of urine diminished in size.	3. Stream of urine normal.
4. Pain aggravated by defecation.	4. Pain aggravated by urinations.
5. Retention common.	5. Retention rare.
6. Digital examination of the rectum reveals large, tender, prostate.	6. No enlargement, and but little tenderness.
7. Urine clear at end of urination.	7. Urine cloudy.
8. No tenesmus.	8. Tenesmus marked.





Catheter Scales, French and American Gauges Compared.

Treatment.—The patient should be placed in bed, with the hips elevated, leaches to the perineum, belladonna and opium suppositories, a milk diet, and the internal administration of

℞. Tincture aconiti . . gtts. xxiv
Tincture belladonnæ . fʒi
Acid boracic . .
Sodii bromidi . . āā ʒii
Liq. potassi citratis q. s. ad fʒvi
M. S. fʒss every four hours.

At the end of from three to five days the acute symptoms will have subsided, then intravesical irrigations may be employed with benefit.

(1) Nitrate of silver, 1 to 10,000 gradually increased.
(2) Corrosive sublimate, 1 to 30,000 " "
(3) Carbolic acid, 1 to 2,000 " "
(4) Permanganate of potash, 1 to 8,000 " "
(5) Boracic acid, 2 per cent. solution
(6) Thiersch's solution (salicylic acid ʒss, boracic acid ʒiiiss and water to make a quart).

These irrigations should be given daily, as hot as can be comfortably borne, and gradually increased in strength according to the effect produced, As a general rule, permanganate is to be recommended in the more acute conditions, and nitrate of silver for the chronic

In the later stages, the reparative process may be somewhat hastened by the internal use of the balsams, copaiba, cubebs, etc.

Chronic Cystitis.

Is caused by such conditions as interfere with the incomplete evacuation of the bladder, as tight stricture, enlarged prostate, atony, tumors, and stone.

Symptoms.—The symptoms are similar to those of the acute, but not so marked. The urine is cloudy, containing mucus and pus in abundance, and a thick tenaceous, ropy or stringy, muco-purulent substance. It is alkaline in reaction, due to ammoniacal fermentation, with deposit of phosphates.

Prognosis.—Chronic cystitis of long standing is very prone to infect the kidneys by continuity of tissue, as pyelitis, and pyelonephritis.

Treatment.—For the successful treatment of chronic cystitis the predisposing cause (stricture, enlarged prostate, stone, tumor) must be searched for and removed. The diet must be regulated so as to avoid all highly-seasoned food, pastries, red meats, tea, coffee, etc. Alcohol in all forms is to be strictly interdicted. The patient should partake freely of mineral waters, and saline diuretics (citrate of potash) should be given in such doses as to render the urine neutral.

Relief is often given by the balsams in chronic cystitis, and the following prescription may be tried:

℞. Salol, ... grs. iii
Oleii santali . . . gtts. xv
Balsam copaiba . . gtts. x
Oleii cinnamomi . . gtts. ii

M. Ft. capsula 1. S. From four to six to be taken daily.

For the local treatment, instillations may be employed when the inflammation is limited to the vesical neck. Nitrate of silver is to be used with an Ultzman's syringe, fifteen drops of a half to a five per cent. solution being placed in the prostatic urethra every third or fourth day.

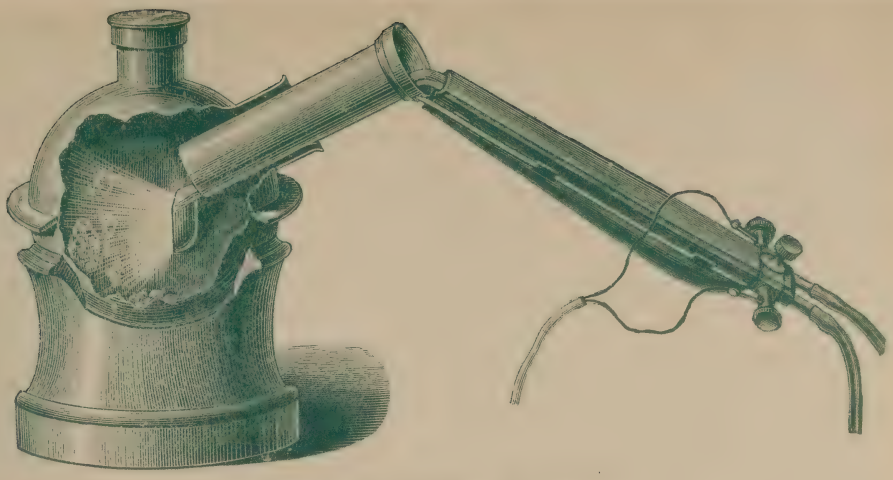
Irrigation may be used as for the acute variety of the disease, with the exception that the quantity of fluid used at first should be small owing to the contraction of the bladder. Nitrate of silver is to be preferred, beginning with a strength of 1 : 8,000 and gradually increased in strength according to the effect produced. The urine must first be drawn off, and the bladder washed out with a boracic solution before the nitrate of silver is used.

When the bladder is thickened and contracted, a median perineal cystotomy should be performed and a permanent catheter fixed in place for drainage, to bring about the atrophy of the hypertrophied bladder wall by disuse.

Tuberculosis of the Bladder.

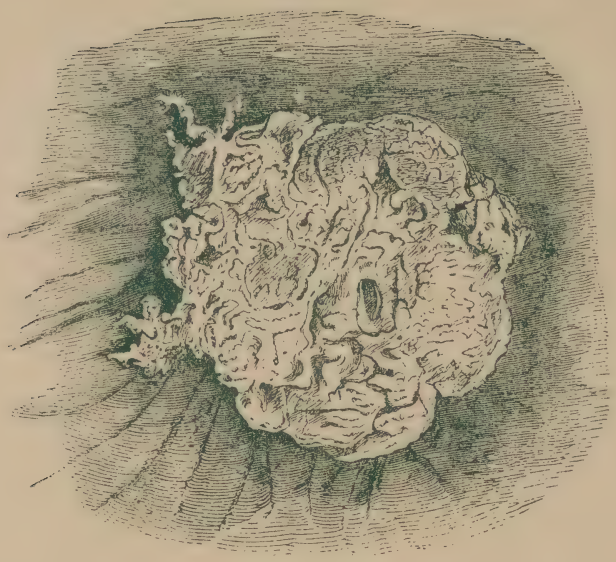
Tuberculosis of the bladder is rarely a primary condition, being usually secondary to tuberculosis of the prostate or kidneys. The trigone is the part usually affected.

Symptoms.—Gradually increasing frequency of micturition in a young man; hæmaturia at the end of urination; some



Bawlick's Bladder Endoscope.

Cystiscopes for vesical exploration of the male and female bladders.



A soft vascular, spongy Tumor of the fundus of the bladder. (Villous.)

Polypoid growths from the mucous membrane of the bladder.

vesical tenesmus; pain at the end of the penis; sudden arrest of the stream from involuntary contraction of the compressor urethræ muscle to relieve pain caused by the passage of urine along the urethra.

The urine contains pus, blood and tubercle bacilli. A cystoscopic examination will usually reveal the cause of the trouble.

Treatment.—In the early stages, general antituberculous treatment should be instituted, such as cod-liver oil, iodide of iron, change of climate, etc.

Locally, the bladder should be emptied of urine by careful catheterization, gently irrigated with boracic acid solution, and an instillation of twenty drops increasing to two fluid ounces of a solution of bichloride of mercury 1 : 5,000 gradually increased to 1 : 1,000, should be given every second or third day. Occasionally the instillation of two or three drachms of a 10 per cent. emulsion of iodoform in glycerine may prove useful.

In more advanced cases, a suprapubic cystotomy should be done, and the diseased surface freely curetted; the raw surface left is to be cauterized with carbolic acid 1 to 5, in glycerine, or when the lesion is small pure acid may be employed, followed by a liberal dusting of iodoform powder. The fistulous opening should not be allowed to close until all symptoms of pain and cystitis have disappeared.

Tumors of the Bladder.

These are extremely rare and may be either primary or secondary.

Varieties.—(1) Papillary fibroma (most common), (2) carcinoma, primary and secondary, (3) mucous polyps, (4) myomata, (5) myxomata, (6) sarcomata, (7) adenomata, and (8) dermoids.

Symptoms.—Hemorrhage may extend over a long time, occur spontaneously and suddenly, and without any attending symptoms; residual urine, retention of urine, and intermittent stream. Pain becomes pronounced when cystitis develops; pus is then found in the urine.

Tumors are often associated with secondary calculus formation.

Diagnosis.—The use of the cystoscope will reveal the true nature of the case in the majority of instances.

Treatment.—Suprapubic cystotomy. In exposing the interior of the bladder a Watson speculum will be found useful. The removal of the growth is effected by sharp spoons, curette forceps and ecraseur, the base of the growth being cauterized with the Paquelin cautery.

In extensive disease the entire bladder may be removed and the ureters transplanted into the colon. Hemorrhage is usually severe and must be controlled by pads and ligatures. The wound in the bladder may be closed immediately or allowed to granulate, depending upon the condition of the mucous membrane at the time of operation (cystitis).

Vesical Calculus.

Stone in the bladder.

Varieties.—Calculi may be classified under the following headings:

(1) Those formed from the natural saline constituents of the urine (uric and phosphatic stones).

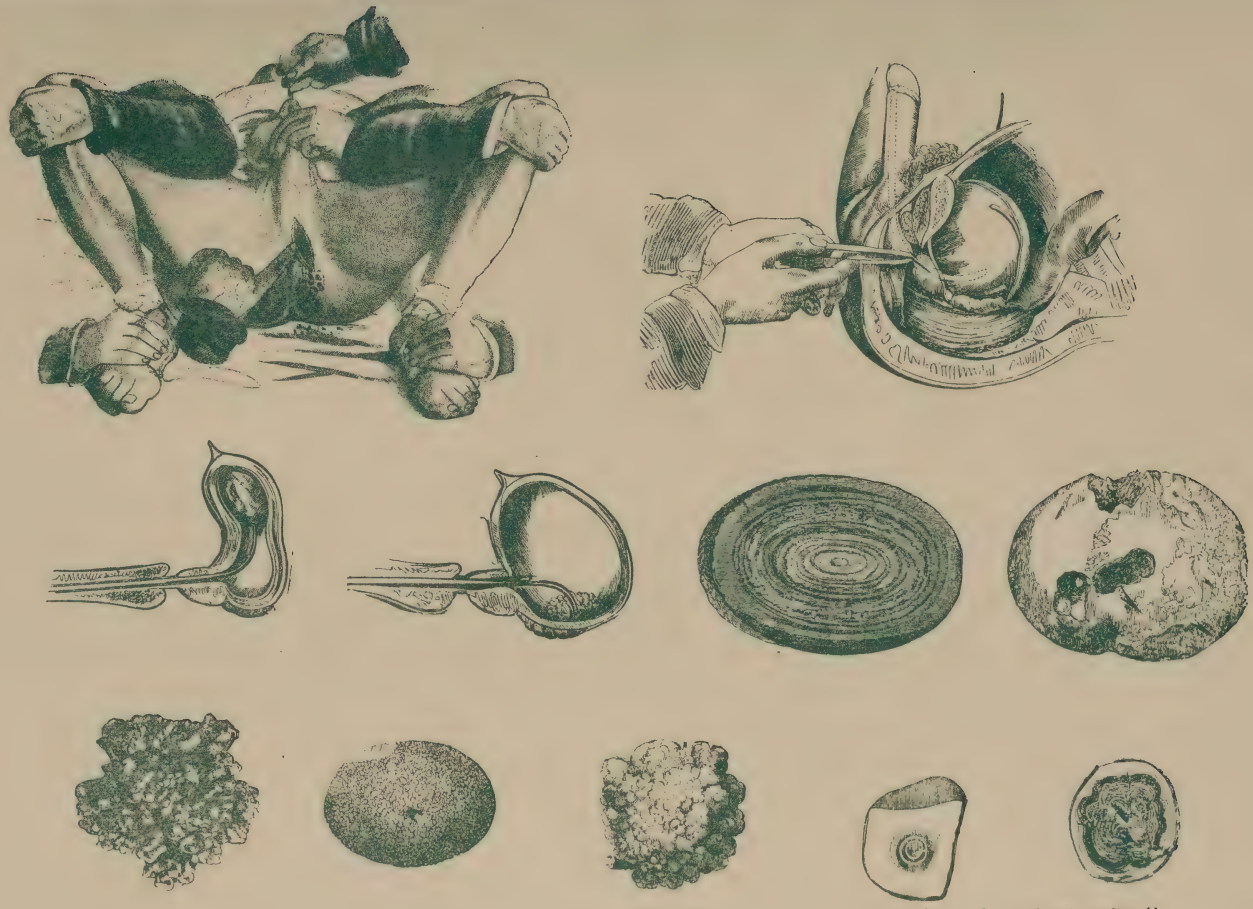
(2) Those formed of elements often, but not necessarily, found in healthy urine, but never in excess except as a result of disease (oxalic stone).

(3) Those formed from elements which are foreign to the urine altogether, being excreted by renal action in certain morbid states of the body (cystine and xanthine).

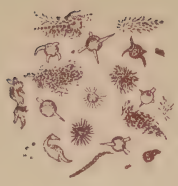
When the salts of the urine are deposited in a solid form as crystaline particles, the condition is described as sand. When about the size of a hemp-seed or pea they are termed gravel. When as large as the kernel of a hazel nut, they are termed concretions, and when too large to pass through the urethra they are termed calculi.

Causes.—The common varieties, in the order of their frequency, are uric, phosphatic, and oxalic.

A large number of vesical calculi (uric and oxalic) begin in the kidney; these in time pass into the pelvis of the organ, and are transferred along the ureter to the bladder, where, if not expelled from the viscus, they constantly attract to themselves the salts of the urine until they attain a sufficient magnitude to create the usual symptoms of calculus.



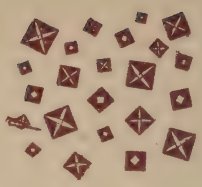
Lateral operation of lithotomy. Sounding bladder for calculus, varieties of vesical calculi.



Urates
Uric Acid

Urates of
Amonium

Phosphates



Oxalates

Vesical Calculus

Urethral Calculus
in the membraneous Urethra.

Calculus in the Bulb of the Urethra.

The phosphatic calculus is not often found in the kidney, being more commonly produced in the bladder (phosphate of lime). Phosphate of lime in the mucus of a diseased bladder meeting with phosphate of magnesia, a triple phosphate results. This combined with more phosphate of lime, makes a fusible calculus, the commonest form.

Stone in the bladder is not confined to any period of life; it may exist before birth, and is met with from infancy to extreme old age. A very large proportion, however, occur in early life. In a table of 8574 cases collected by Gross, 4986 were under twenty years, 748 between twenty and thirty, 438 between thirty and forty, 588 between forty and fifty, 685 between fifty and sixty, 772 between sixty and seventy, and 338 between seventy and eighty.

The formation of stone is supposed to be favored by drinking hard water of limestone districts.

Insufficient food (lack of milk), clothing, and, fresh air, the necessary accompaniments of poverty, appear to encourage calculus formation among children, but not among adults.

Habits of self-indulgence, full diet, and lack of exercise, encourage calculus formation, especially in elderly adult males.

Chronic inflammation of the bladder, atony of the bladder, stricture of the urethra, enlarged prostate, vesical tumors, and foreign bodies, all predispose to the formation of a vesical calculus.

Symptoms.—Increased frequency of micturition, especially during the day; the patient, when in the erect posture, frequently experiences the desire to empty his bladder, because the stone falls down in the base of the bladder in contact with the vesical neck. There is pain at the end of micturition referred to the end of the penis; sudden stoppage of the stream, the calculus acting as a ball-valve; blood, pus and mucus in the urine, priapism, and reflex pains in perineum, thighs, and loins.

Diagnosis.—The diagnosis is made by instrumental exploration of the bladder. The sound should be a metallic instrument, and adapted by its form to freely explore the bladder. It should possess a short, curved beak, so that it can be turned to the right, left, above, and below. (See *Figure 10.*)

When the stone is encysted the surgeon may not be able to demonstrate the metallic click.

When exploring a bladder for stone it is well to do it in a systematic manner. The method commonly adopted is to first explore in the median line, the beak of the instrument pointing towards the fundus of the bladder. The instrument should now be turned so that the beak points to the right side of the patient, then to the left, and finally the post-prostatic pouch and bas-fond. It is advisable to have the bladder partially distended with boracic acid solution before making the examination. The presence of a calculus can always be demonstrated by the X-Ray.

Treatment.—As preventive measures, regulation of the diet, avoidance of alcohol, spices, peppers, etc; and the removal of all predisposing causes located in the bladder, prostate and urethra.

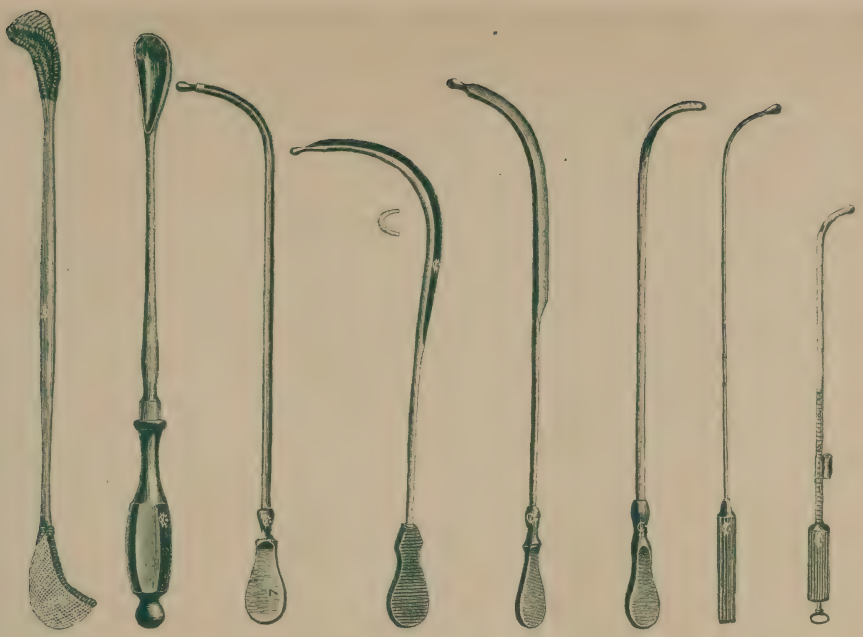
Operative Treatment.—(1) *Lithotomy*, median, lateral, suprapubic. (2) *Lithilopaxy* or crushing.

Before operating upon any case of vesical calculus the patient should be subjected to a preparatory treatment for at least a week. This consists in the use of a milk diet, daily irrigation of the bladder with warm boracic acid solution, and the internal administration of five grains of salol with ten grains of boracic acid, thrice daily. During this period the condition of the kidneys should be ascertained by frequent quantitative, chemical and microscopical examinations of the urine.

Median Lithotomy.—Median lithotomy is indicated in very small hard stones with or without strictures of the deep urethra.

Disadvantages.—Very little room for the manipulation of instruments; great difficulty in introducing the finger into the bladder for purposes of exploration; there is great danger of wounding the rectum and bulb of the urethra, and finally, hemorrhage may be troublesome.

Operation.—Before operating upon any case of stone in the bladder always introduce a vesical sound and ascertain whether the stone is still present, as it is possible that the stone may have escaped from the bladder during urination.

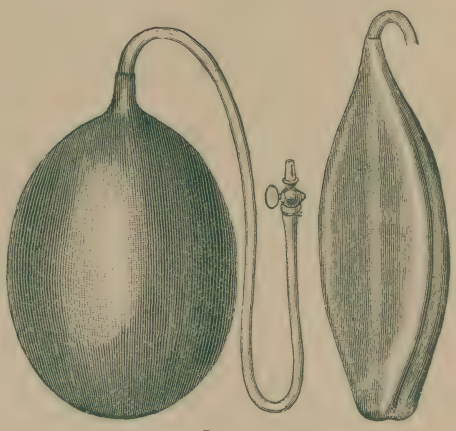


Old No. Fig. 11.
Stone Scoops.

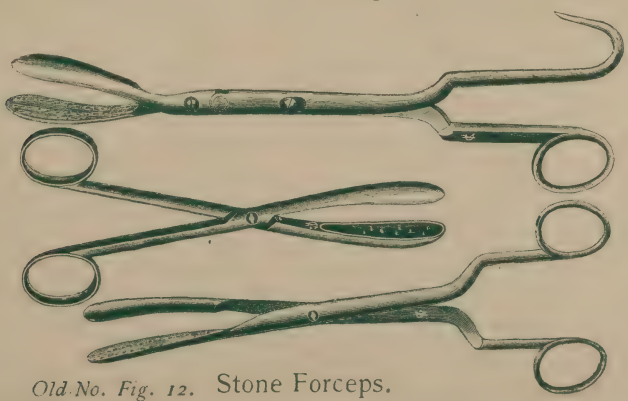
Lithotomy Staff.

Old No Fig. 10.
Stone Searcher.

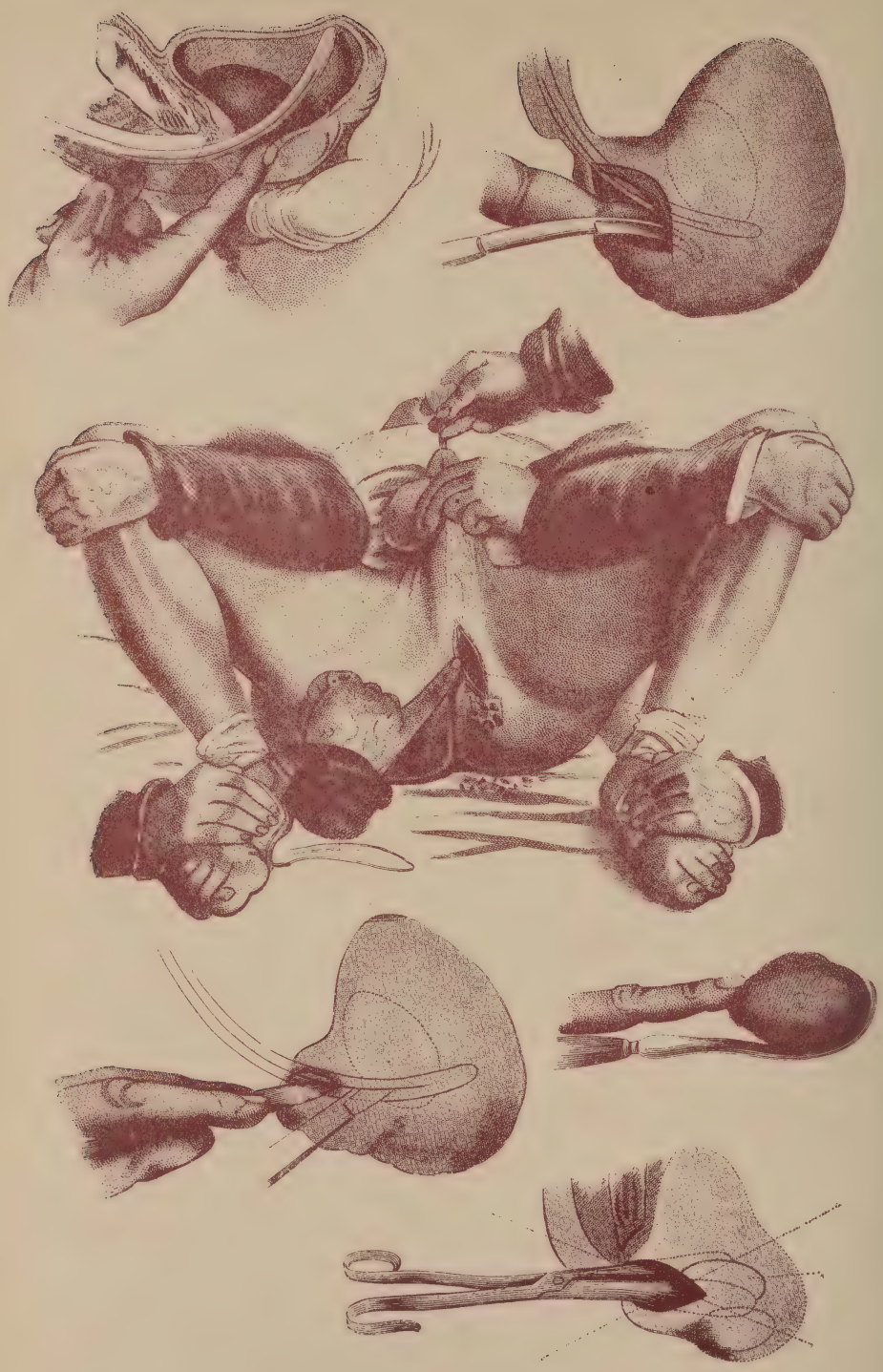
Old No. Fig. 13.
Perineal Tampon.



Old No. Fig. 14. Colpeurynter.



Old No. Fig. 12. Stone Forceps.



Lateral operation for vesical calculus, showing lithotomy position, line of incision, and methods of grasping and removing the stone.

Place the patient in the lithotomy position (legs flexed on the thighs, thighs on the abdomen, and buttocks brought well to the edge of the table). One assistant should have charge of each leg, and the one on the left side of the patient should hold the staff in his right hand.

A catheter is introduced, and the viscus filled with six or eight ounces of boracic acid solution; the patient must be well etherized or the bladder will not retain the fluid. A curved staff with a wide groove is introduced into the urethra, and so held that its handle inclines towards the umbilicus, and exactly in the median line. (See *Figure 11.*)

An incision is now made in the median line of the perineum, beginning one and a quarter inches in front of the anus, and extending to the external sphincter. The point of the knife is made to enter the groove of the staff and the following structures divided from before backwards:—Skin, superficial fascia, perineal center, external sphincter, Colle's fascia, lower border of the anterior layer of the triangular ligament, compressor urethræ muscle, membraneous urethra, posterior layer of the triangular ligament, and apex of the prostate. The finger should now be introduced into the bladder and the staff withdrawn. Forceps or scoop are to be introduced into the bladder along the finger as a guide, and the stone removed. (See *Figure 12.*)

A full-sized Nelaton catheter is to be introduced into the bladder through the perineal incision, and the viscus thoroughly irrigated with boracic acid solution.

If hemorrhage occur, the perineal wound may be packed with iodoform gauze around a catheter. A light antiseptic dressing with a T bandage should be applied. (See *Figure 13.*)

The catheter should be changed every second day for a week and then removed altogether. While in place, the end should be kept in a urinal filled with 1 to 20 carbolic acid solution to prevent infection.

Lateral Lithotomy.—Lateral lithotomy is indicated in medium sized hard stones with stricture of the deep urethra.

The preliminaries of this operation are similar to those for the median.

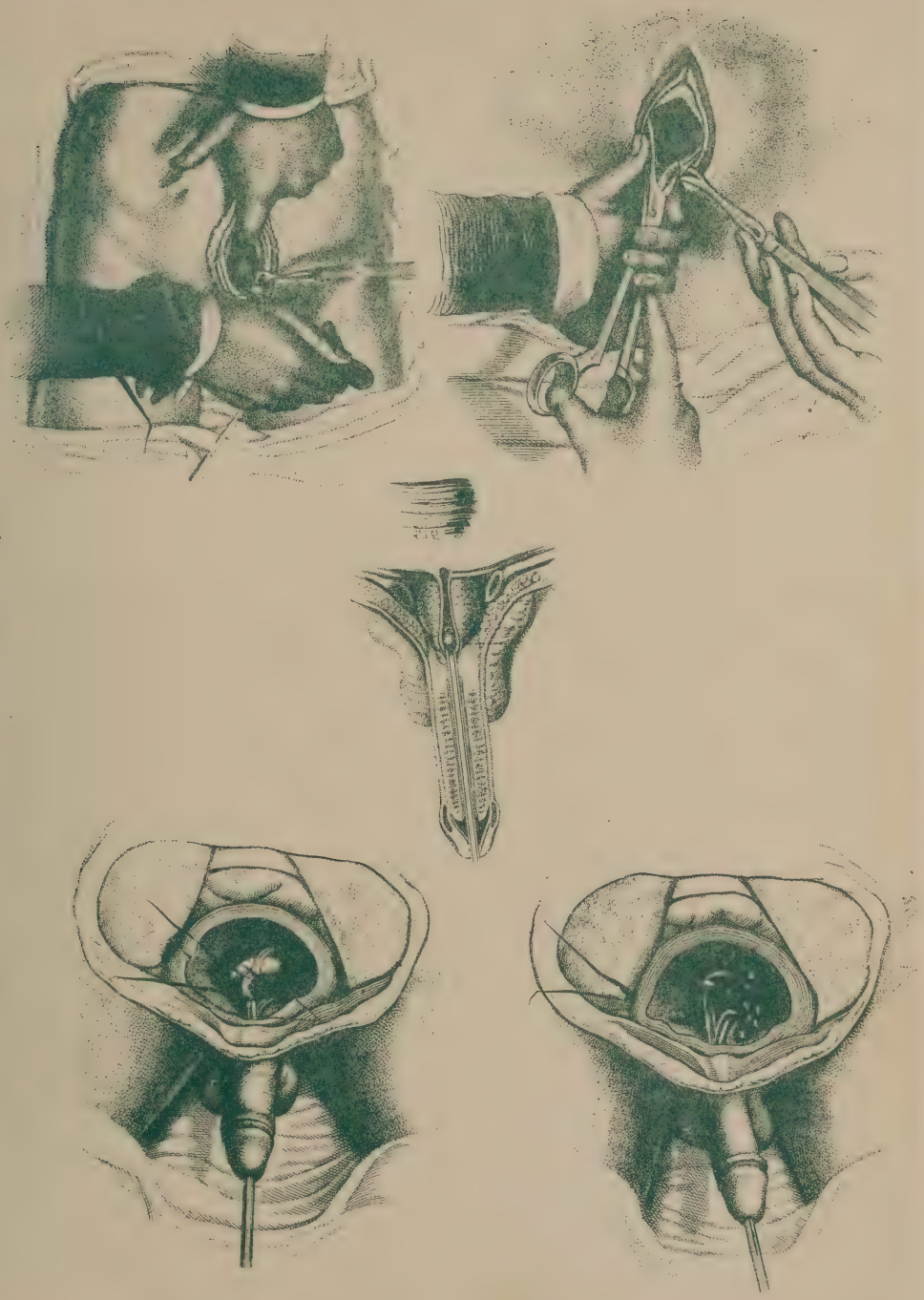
The perineal incision should be begun at a point one-and-a-quarter inches in front of the anus in the median line, and extend to a point midway between the anus and the left tuber ischii. The finger is introduced into the wound and the staff located, and the point of the knife made to enter the groove of the staff, the handle depressed, the blade at the same time being turned a little to the left, and pushed steadily along the groove until a gush of urine announces that the neck of the bladder has been sufficiently divided. The following structures are divided in this operation :—Skin, superficial fascia, transversus perinæi, muscle, vessel, and nerve; Colle's fascia; the anterior layer of the triangular ligament; external hemorrhoidal vessels and nerves; compressor urethræ muscle; membraneous urethra; posterior layer of the triangular ligament; levator ani muscle, and left lateral lobe of the prostate.

Introduce the index finger into the bladder; remove the staff; introduce the forceps along the finger as a guide, and remove the stone. The after treatment is now similar to that for the median operation.

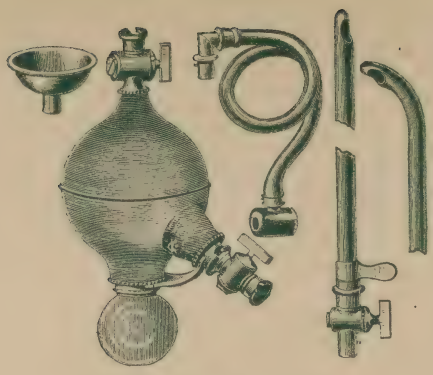
Suprapubic Lithotomy.—Suprapubic lithotomy is indicated in very large hard stones; when calculi are complicated by enlarged prostate; in encysted calculi; when the hips are anchylosed so that the patient cannot be placed in the lithotomy position; and when the patient has a very deep perineum.

Operation.—Introduce a colpeurynter bag into the rectum and distend with from six to ten ounces of fluid, so as to push the bladder forward and displace upwards the prevesical peritoneal layer. (See *Figure 14.*) Introduce a catheter into the bladder and distend the viscus with from six to ten ounces of boracic acid solution. If the bladder will not retain the solution an elastic ligature may be placed around the penis.

An incision three inches in length is made in the linea alba, beginning at the pubic symphisis; the subcutaneous fat, often plentiful in amount, being divided, and any vessels secured, the linea alba is identified and divided. The transversalis fascia is now picked up and divided at the lower angle of the wound. Retractors should now be introduced, and the edges of the

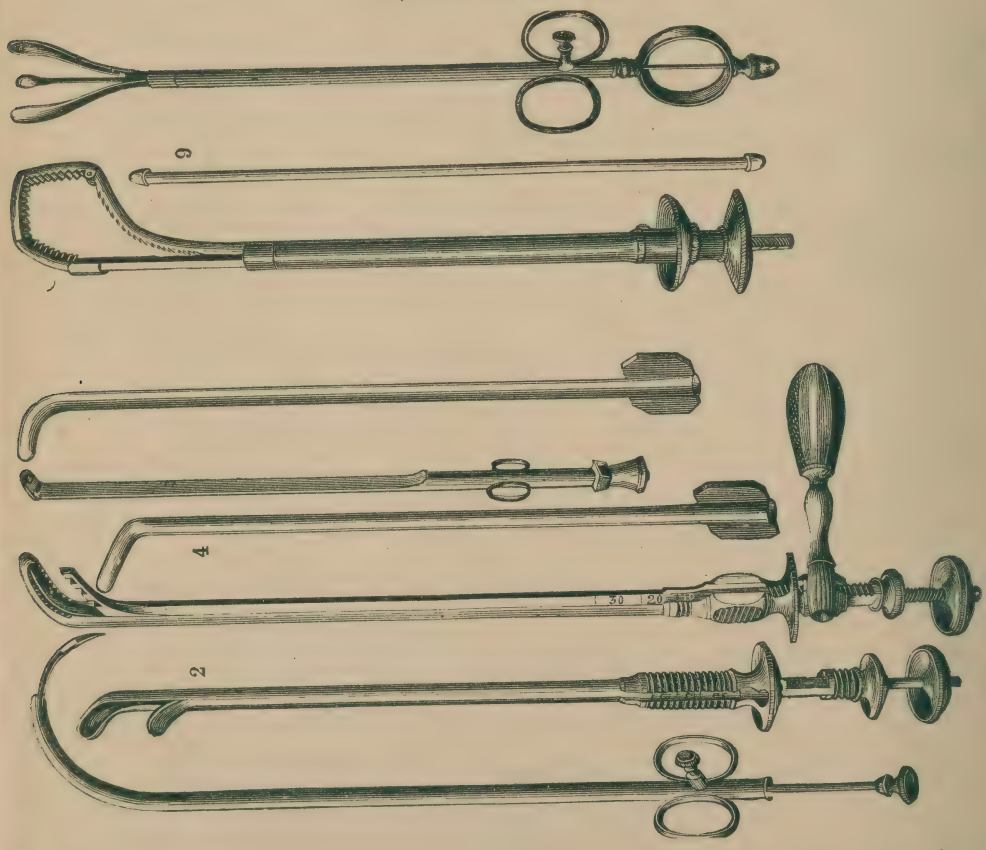


The high or suprapubic operation for vesical calculus.



Bigelow's Evacuator.

Bigelow's Lithotrite.



Various forms of Lithotrites, and instruments for crushing a stone when found too large to remove through the lithotomy incision.

wound drawn wide apart. A layer of loose fat, frequently having large veins in it, next comes into view, lying over and concealing the bladder. This must be carefully divided, and all bleeding points ligated.

A spot on the anterior surface of the bladder having been selected about three-quarters of an inch from the pubes is punctured, and the left index finger introduced into the bladder and the calculus located. Forceps or scoop should be introduced along the finger as a guide and the stone removed.

When cystitis is present a catheter should be introduced into the bladder through the urethra, and Guyon's double tubes (two long drainage tubes having a caliber of 15 F.) introduced through the suprapubic wound into the bladder. The wound in the bladder and in the subcutaneous structures should be sutured together around the catheter, leaving room for a small piece of iodoform gauze to drain the lower part of the space of Retzius. The skin incision should be closed in a similar manner. As soon as the urine flows clear the tubes may be removed, and the remaining fistula allowed to close by granulation.

When little or no cystitis exists the wound in the bladder should be closed by suture as follows: A continuous suture of fine catgut for the mucous coat, then a layer of interrupted catgut sutures, not going deeper than the mucous membrane; finally the skin and deeper structures are closed with silkworm gut. A catheter should be passed into the bladder through the urethra and retained in place until the wound is completely healed.

Lithilopaxy.—Crushing and removing a stone at one sitting. It is the operation of choice in all cases of vesicle calculus unless contra-indications are present, the contra-indications being the indications for the various forms of lithotomy.

Indications.—Medium-sized soft stone, when uncomplicated by enlarged prostate, when the stone is not encysted, when there is no stricture of the urethra, when the urethra is not acutely inflamed, and when the caliber of the urethra is sufficient to admit a lithotrite.

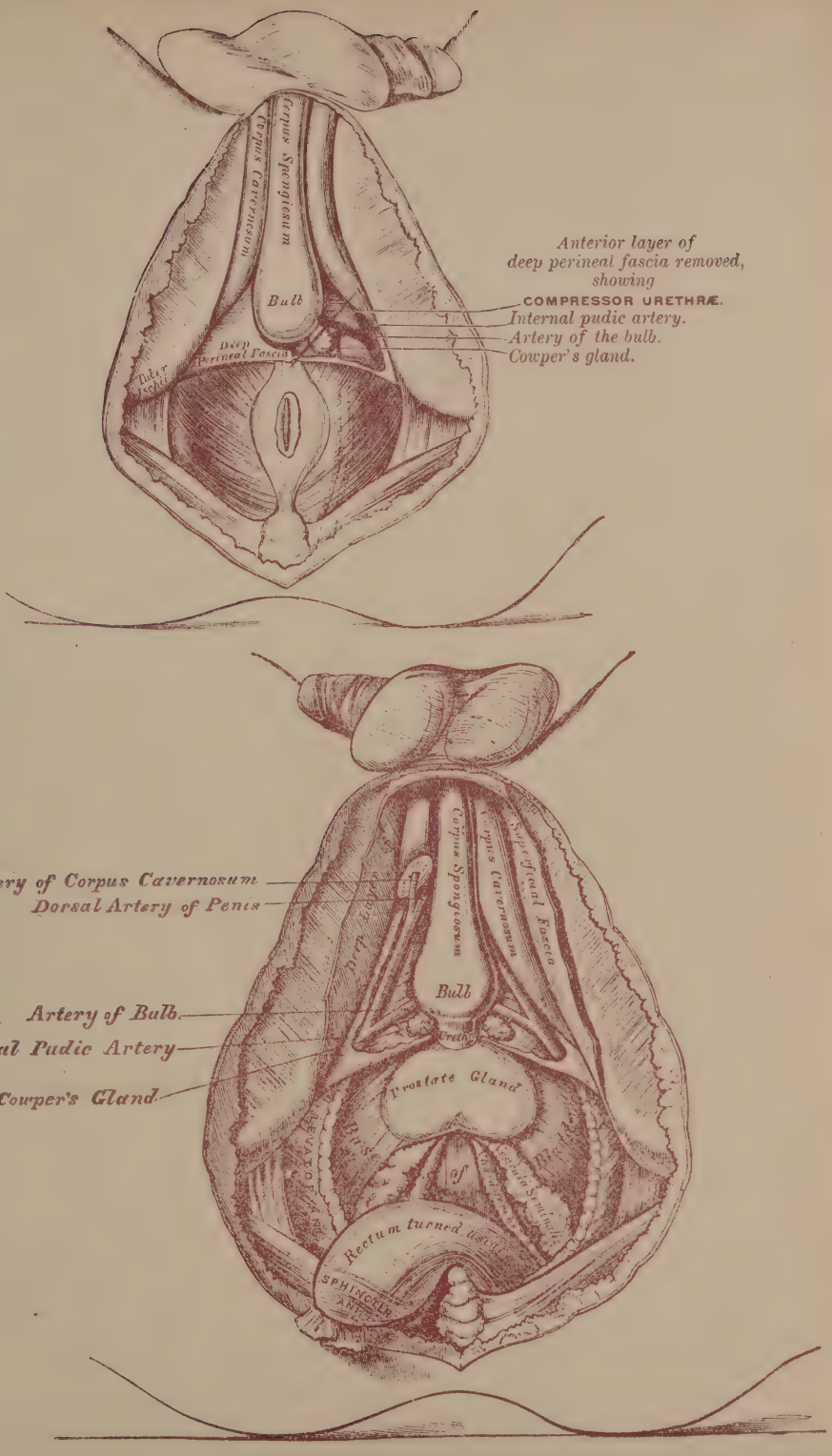
The operation should never be undertaken except by those

who have had considerable experience in the handling of urethral and vesical instruments, as great damage may be done to the bladder.

Complications.—The prolonged use of a lithotrite may occasion an epididymitis or urethral fever unless the operation be done in a thoroughly aseptic manner.

Operation.—Irrigate the bladder thoroughly with boracic acid solution, allowing six or eight ounces of the fluid to remain in the organ. The catheter is now withdrawn and the lithotrite introduced as you would a steel sound; this may be a little difficult because of the sharp angle by which the beak joins the shaft. (See *Figure 15.*) Keep the instrument exactly in the median line, open the jaws and attempt to catch the stone; if not caught in this position turn to the right, then to the left, and finally to the bas-fond. In whatever position the stone may be caught by the lithotrite, the instrument should always be brought to the median line, and the beak gently rotated from side to side, in order to prevent the wall of the bladder being caught in the jaws.

The instrument should now be held firmly, and locked; the handle being turned slowly at first until the jaws bite well into the stone, then more and more until the stone is crushed. These manipulations are repeated until all fragments are crushed; the lithotrite is then withdrawn and an evacuating tube, straight or curved, having a caliber of 30 F., with a large eye on its anterior surface, is introduced into the bladder, and attached to the Bigelow evacuator, the latter having previously been filled with boracic acid solution. The instrument consists of a rubber bag, and a glass ball at the bottom for collecting the fragments. The evacuating connection which extends into the interior of the rubber bag is open at the end, and its circumference perforated with a number of small holes, so that as the water is pumped back into the bladder, it passes through the minute perforations rather than through the end of the tube, because the sum total of the diameter of these perforations is greater than the diameter of the tube, hence the water flows through the sieve and the fragments of calculus must fall into the glass bulb at the bottom. (See *Figure 16.*)


Corpus Spongiosum
Corpus Cavernosum
Bulb
Deep Perineal Fascia
Anterior layer of deep perineal fascia removed, showing
COMPRESSOR URETHRÆ.
Internal pudic artery.
Artery of the bulb.
Cowper's gland.
Artery of Corpus Cavernosum
Dorsal Artery of Penis
Artery of Bulb.
Internal Pudic Artery
Cowper's Gland
Superficial Fascia
Prostate Gland
Rectum turned
SPHINCTER ANI

While the left hand supports the evacuator, the surgeon with his right hand being very careful not to use too much force, but yet quickly squeezes the bulb sufficiently to send into the bladder about two ounces of fluid; on releasing the rubber bag, the return flow of fluid carries with it the fragments of stone. Occasionally during the manipulation of the evacuator the surgeon experiences a sensation resembling a fish-bite. This indicates that the mucous membrane of the bladder is being caught in the eye of the evacuating tube, and more water must be introduced into the bladder.

When no more fragments come, the evacuator is withdrawn, and a vesical sound introduced to see if any fragments too large for evacuation remain; if so, they are to be recrushed and evacuated in the same manner. The bladder is now to be irrigated with warm boracic acid solution.

The diet should consist of milk. Ten grains of boracic acid with five grains of salol should be administered thrice daily. The patient may be allowed to get out of bed in a week.

Rupture of the Bladder.

Causes.—Traumatism to the lower abdomen, especially when the bladder is distended; fractures of the pelvis; and finally it may be ruptured by the lithotrite or colpeurynter in operations for vesical calculus.

Varieties.—(1) *Intraperitoneal.* (2) *Extraperitoneal.* Extraperitoneal into either the space of Retzius or recto-vesical space.

Symptoms.—*Intraperitoneal rupture*—Inability to urinate (this power is occasionally preserved in both varieties of injury); some bloody urine drawn off by the catheter; difficulty of manipulating an instrument in the contracted bladder. If the urine is healthy, peritonitis may not develop for from thirty-six to seventy-two hours, otherwise it is immediate and rapidly fatal. There may be fluctuation and dulness in the flanks, hypogastric pain, and always profound shock.

Extraperitoneal rupture.—Inability to urinate; a little bloody urine is withdrawn by the catheter; manipulation of the beak of the catheter will show that the bladder is contracted. When the rupture is anterior, the extravasation of urine will occur in the

prevesical space, when posterior, into the recto-vesical space, along the rectum, appearing at the side of the anus. There is always more or less shock.

Diagnosis.—Catheterize and withdraw the urine, then inject a known quantity of boracic acid solution, withdraw fluid, and see if the quantity corresponds with amount injected.

Treatment.—*Intraperitoneal rupture.*

A laparotomy should be done and the rent in the bladder located and closed by a Czerny-Lembert suture. Then inject boracic acid solution to see if the line of suture is water-tight. Flush out the abdominal cavity with boiled water or Thiersch's solution and close the abdominal wound with drainage. A catheter should be introduced into the bladder through the urethra and retained in place for at least five days.

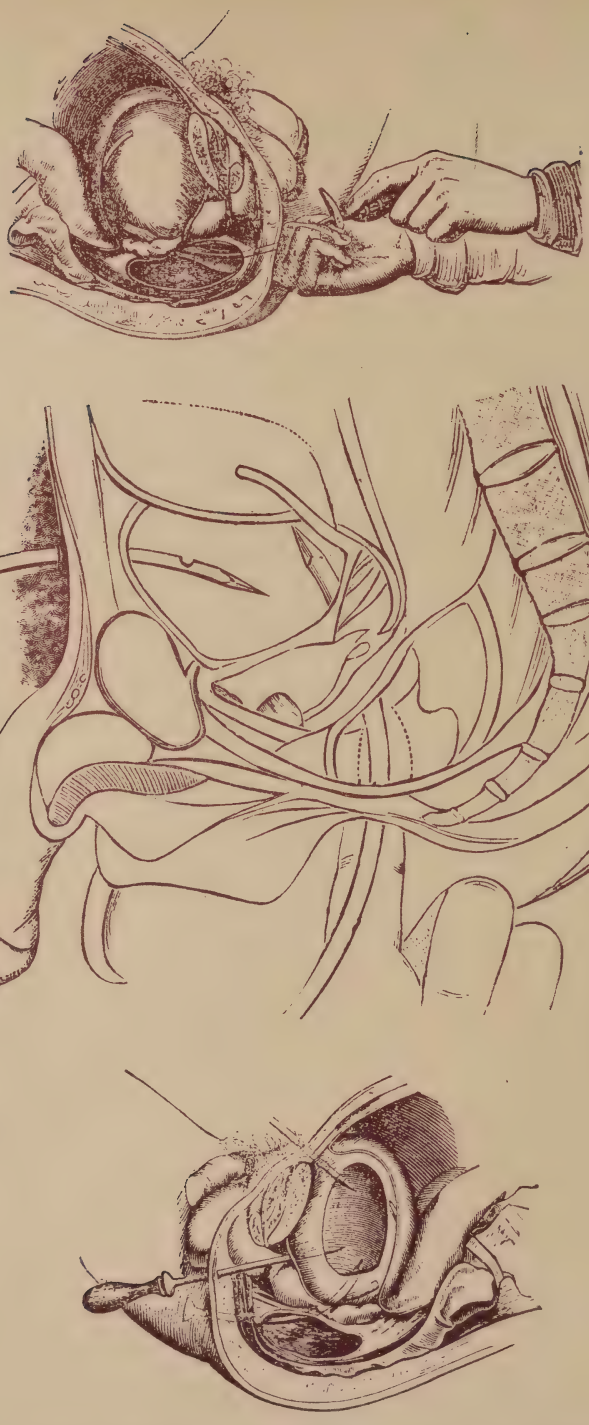
Extraperitoneal rupture into the *Space of Retzius.*—Open the prevesical space as for a suprapubic operation, and if blood stained fluid wells up from the anterior surface of the bladder, the organ should be thoroughly explored for the tear, and the wound closed in a manner similar to that described in suprapubic lithotomy. Close the abdominal incision, leaving sufficient room for an iodoform gauze, drain to aid the escape of urine if the sutures give way. A catheter should be retained in the bladder for at least five days, and twice daily the bladder should be gently irrigated through this instrument.

Recto-vesical space.—Introduce a staff into the bladder, first placing the patient in the lithotomy position, and then doing a median perineal cystotomy (see median lithotomy). A large Nelaton catheter should be introduced into the bladder through the perineal wound and retained in place for ten days. Areas of extravasation about the rectum should be freely opened to prevent cellulitis. The bladder should be irrigated with boracic acid solution night and morning.

Cystotomy.—The operation for opening the bladder apart from such cases as exploring for growths, foreign bodies, etc..

Varieties.—(1) Suprapubic. (2) Median perineal.

Indications.—In cases of cystitis when the urine is extremely foul and there is danger of ascending infection (kidneys). In



Methods of puncturing the bladder with a trocar for retention of urine.

turberculosis of the bladder; as a palliative measure (rest). In rupture of the urethra or traumatic stricture with fistula and for retrograde catheterization. For description of operations see median lithotomy and suprapubic lithotomy.

Puncture of the Bladder.—It is sometimes necessary to puncture the bladder to relieve over-distension in cases of acute retention of urine.

Methods.—(1) Suprapubic. (2) Subpubic. (3) Cock's operation (perineal). (4) Through the rectum above the prostate. Either a straight or curved trocar and canula may be used according to the position elected.

The Scrotum.

Anatomy.—The scrotum a pendulous, membraneous pouch containing the testicles, is composed of the following tissues: (1) the skin, (2) the dartos, (3) the external spermatic fascia, (4) the cremasteric or middle spermatic fascia, (5) the internal spermatic fascia, and (6) the tunica vaginalis.

Owing to the attachments of the dartos to the skin, it must be remembered that when operating upon the scrotum, the skin edges must be carefully everted, as, like in the neck, there is a constant tendency towards inversion.

Œdema of the Scrotum.

Causes.—(1) Rupture of the bulbous portion of the urethra (extravasation of urine), (2) general anasarca from heart, liver, and kidney lesions, and (3) septic inflammations.

Symptoms.—Bilateral uniform enlargement, the scrotum preserving its normal outline, with pitting on pressure.

Diagnosis.—Œdema of the scrotum must be distinguished from hydrocele, as in rare instances, the œdema may be unilateral.

Œdema of the Scrotum.	Hydrocele.
1. Usually bilateral.	1. Usually unilateral.
2. Outline of scrotum preserved.	2. Outline altered.
3. Pits on pressure.	3. No pitting on pressure.
4. Not translucent.	4. Translucent.
5. Rugæ obliterated.	5. Rugæ not obliterated.

Treatment.—Remove the cause, and relieve tension by numerous small incisions under strict antiseptic precautions.

Gangrene of the Scrotum.

Gangrene of the scrotum is an extremely rare condition.

Causes.—Uninary infiltrations; erysipelas; thrombosis and embolism; as a complication of grippe, typhus and diabetes; traumatism, and frost-bite.

Treatment.—The same general rules apply here as for gangrene in any other part of the body. After the slough separates the testicles must be covered by a plastic operation, or by bringing together the granulating edges.

Elephantiasis.

A condition rarely seen in this country.

Causes.—Some obstruction to the flow of lymph, which may be either inflammatory in origin or result from the invasion of the tissues of the body by the filaria sanguinis hominis.

Symptoms.—The growth consists of a hypertrophy of the tissues of the scrotum, the penis usually participating in the disease. The surface of the skin becomes thickened, indurated, sometimes rugus or knotty, and crossed with deep fissures.

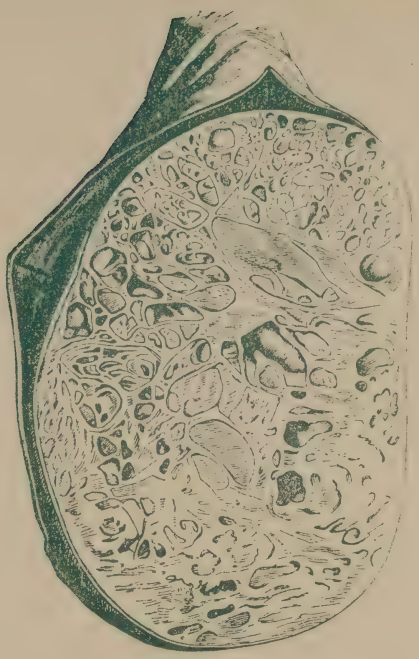
The scrotum sometimes attains enormous dimensions (fifty to one hundred and fifty pounds). In consequence of this great weight, the spermatic cords are much elongated, and the cremaster muscle much thickened. The testicles usually remain unaffected.

Treatment.—In the early stages the administration of large doses of the iodide of potash is frequently of great service. When the bulk of the tumor becomes so great as to seriously interfere with the comfort of the patient excision is the proper remedy.

As these operations are often extremely bloody, the base of the tumor should be surrounded with an Esmarch band, the testicles exposed, and all diseased tissue cut away. If sufficient tissue is not at hand for closing in the testicles, they will be entirely covered with granulations if left exposed.

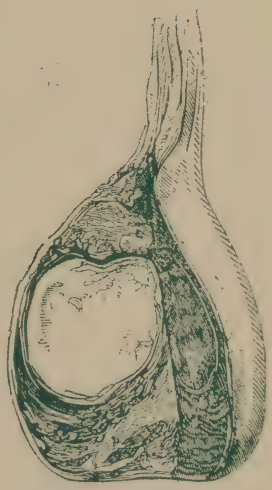
As these cases are occasionally complicated with rupture, the surgeon should remember the possibility of encountering a hernial sac.

Elephantiasis of the scrotum.

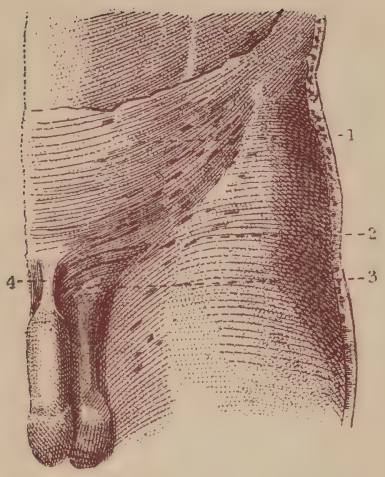


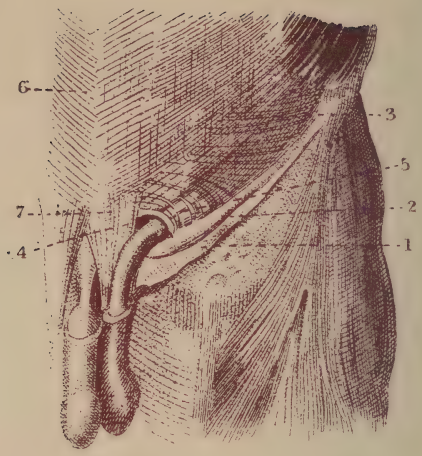
Cystic disease of Testicle.

Tuberculosis of Testicle.



Abscess of Testicle.





Spermatic Cord and Suspensory Ligament of the penis.

Wounds of the Scrotum.

Wounds of the scrotum may be either incised, contused, lacerated or gunshot.

Wounds of the scrotum are similar to like injuries of other parts of the body and are treated upon the same general principles. The surgeon should see that all hemorrhage is controlled before closing the wound, as these vessels may continue to bleed in the loose cellular tissue, and large accumulations of blood result.

Tumors of the Scrotum.

With the exception of epithelioma, tumors of the scrotum are rare. Cysts, fibromata, lipomata, enchondromata, and dermoids have been reported.

Epithelioma of the Scrotum.

This condition was formerly known as "chimney sweepers' cancer" because of its frequency among people engaged in this work.

Symptoms.—It begins usually as a small papule or nodule, becoming excoriated, and finally covered by a scab. When this scab is removed it will be found that the original excoriation has increased in size and become an ulcer. The edges become indurated, hard and raised above the level of the surrounding tissue; the base of the ulcer is uneven; granulations, when present, are unhealthy, and an acrid, irritating, watery pus exudes.

As the disease advances the tissues of the scrotum are progressively destroyed, and finally the inguinal lymphatic glands become involved.

Treatment.—Early and complete excision of the growth, carrying the incision well into the healthy tissues. All enlarged inguinal glands must be removed.

Spermatic Cord.

Anatomy.—The vessels and nerves, to, and the excretory duct from the testicle, make up the so-called spermatic cord. It is composed (1) the spermatic artery, (2) the spermatic plexus of veins, (3) the vas deferens, (4) lymphatics, (5) sympathetic nerves, (6) the artery of the vas, (7) the cremaster muscle, (8) the artery of the cremaster, (9) the genital branch of the genito-crural nerve,

and (10) the obliterated processus vaginalis. It extends from the internal abdominal ring, through the inguinal canal, and into the scrotum as far as the summit of the testicle.

Contusions and Wounds of the Cord.

These may result from wounds inflicted over the pubis, and from kicks and blows applied over the same region. If the vessels are divided the hemorrhage may be free, and if the cord is ruptured, the ends may retract within the canal, the escaping blood forming an elongated, sausage-shaped tumor, parallel to and above Poupart's ligament (hematocele).

Treatment.—Ligature of all bleeding points, with rest, elevation, and pressure.

Inflammation of the Cord.

Funiculitis or inflammation of the spermatic cord is of rare occurrence.

Causes.—Extension of inflammation from the posterior urethra and from phlebitis.

Symptoms. — Swelling, induration, great tenderness, and a sense of weight and dragging experienced along the course of the inguinal canal and in the back.

Treatment.—Rest in bed, the use of leeches or the application of cold or lead water and laudanum, with sufficient support to the testicles to prevent dragging on the cord.

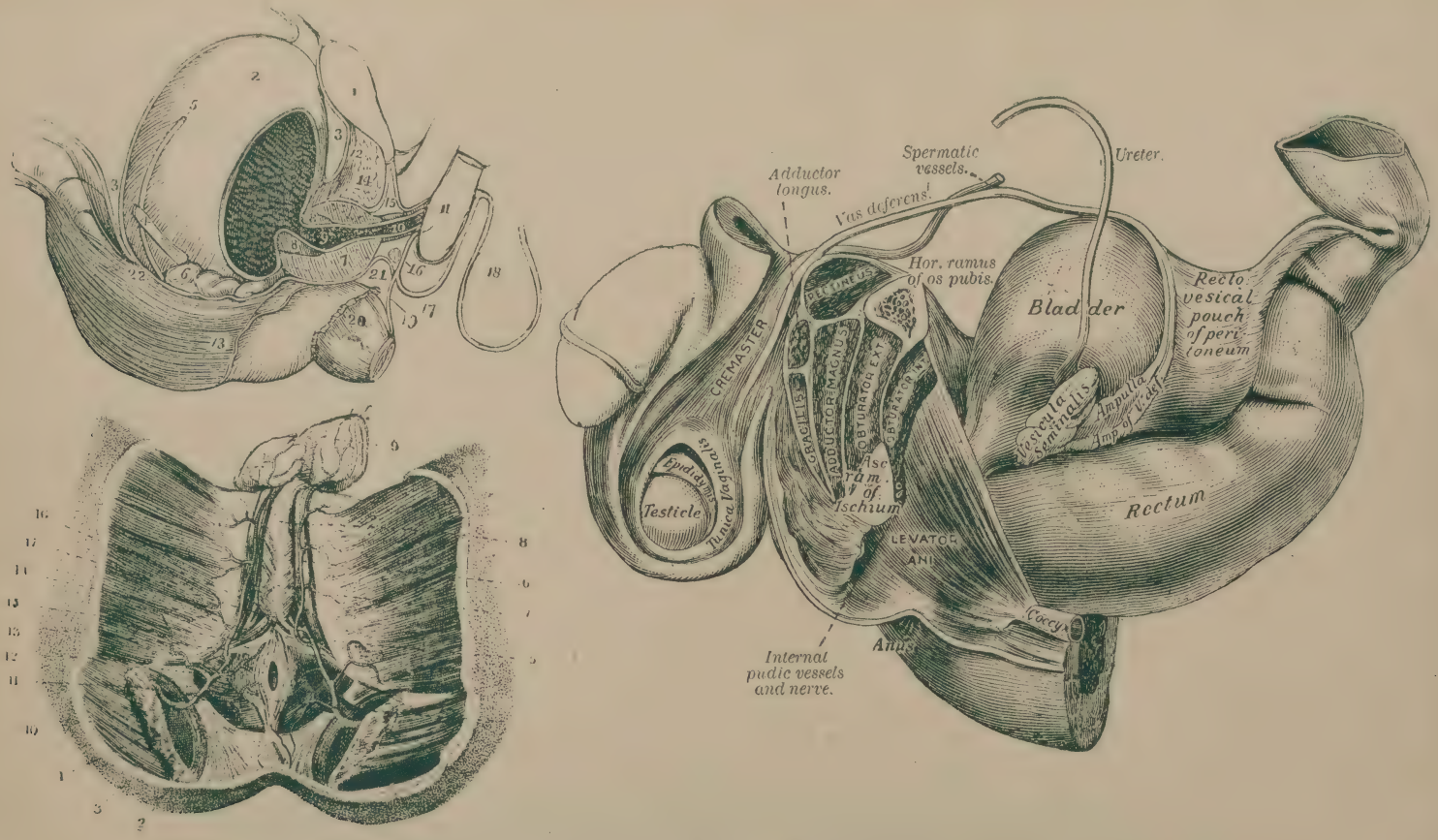
Tumors of the Cord.

Fatty tumors of the cord are quite common, and may develop in the inguinal canal or scrotum.

Symptoms.—Tumor of slow growth, irregular in outline, sometimes lobulated, moving up and down by traction on the cord.

Diagnosis.—A fatty tumor must be differentiated from an epiplocele. This may be exceedingly difficult without an exploratory incision.

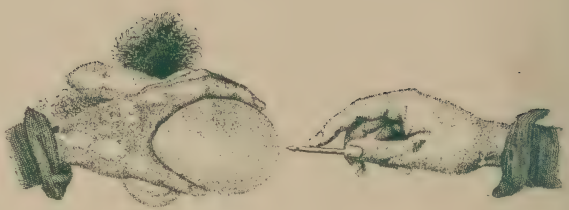
It must be remembered that the epiplocele is within the peritoneum, the lipoma without; the hernia forms from above, the lipoma from below. The presence of an impulse on coughing in a hernia, and its absence in a lipoma, may make it possible to distinguish between the two.



The anatomical relations of the lower genito-urinary tract.

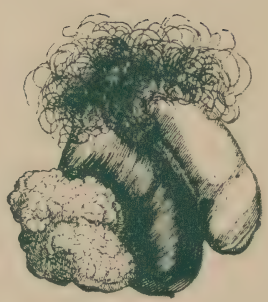
Ecchymosis of scrotum from contusion.

Method of Strapping a Testicle.

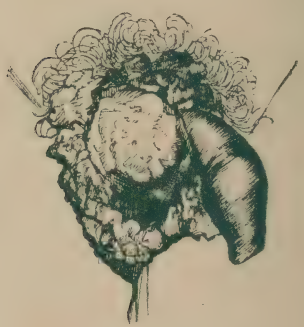


Method of Tapping a Hydrocele.

Section of testicle showing chronic orchitis.



Fungus of testicle.



"Chimney sweaps" cancer (epithelioma of scrotum).

Treatment.—When the tumor becomes inconvenient or troublesome from its size, excision will be necessary. In performing this operation the greatest care should be observed not to wound any of the components of the cord.

Myomata and *sarcomata* are but rarely seen.

Varicocele.—A varicose condition of the veins of the pampiniform plexus. The condition is most frequently seen in the young from the fifteenth to the thirtieth year, and usually involves the left side.

Causes.—Owing to the absence of a valve in the left spermatic vein at the point where it empties into the renal, varicocele almost invariably occurs on the left side. The left side is still further predisposed by the angle (right) which the left spermatic forms with the left renal, and by the relation which the vein bears to the sigmoid flexure (posterior). The left spermatic vein is much longer than the right, consequently the weight of the column of blood is greater on the left side than on the right.

Landouzy examined 5639 army recruits, and states that 87 per cent. of the cases of varicocele were on the left side, 6 per cent. on the right side, and 7 per cent. on both sides. Besides the mechanical conditions favoring the development of varicocele, there are a number of other causes—heavy lifting, straining efforts in defecation on account of constipation, prolonged standing or walking, excessive venereal indulgence, masturbation, and tumors situated in the abdominal cavity pressing upon the veins.

Symptoms.—It develops gradually, and as it progresses there is experienced a sense of weight and dull, aching pain, extending along the cord and to the small of the back. As the veins increase in size they form soft, doughy, convoluted masses comparable to a bunch of earth worms, extending from the base of the scrotum to the external abdominal ring. The scrotum, in consequence of additional weight, becomes relaxed and elongated, the color of the blood in the veins being quite visible through the skin.

When the varicocele becomes large it is not infrequently associated with atrophy of the testicle from pressure.

These patients frequently suffer from (sexual neurasthenia) mental depression, impotence, headache, nervousness, dyspepsia, and emaciation.

Diagnosis.—Varicocele may be confounded with scrotal hernia and congenital hydrocele.

A hernia cannot return when once reduced and the finger placed over the ring while a varicocele can.

A congenital hydrocele transmits light while a varicocele does not.

Treatment.—The treatment may be palliative or radical.

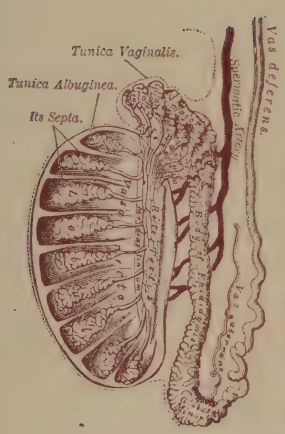
The palliative treatment indicated in mild cases consists in the regulation of the bowels, cold douches, the avoidance of all exciting causes, and the use of a properly fitting suspensory.

The radical treatment consists in a resection of the veins, and is indicated when the varicocele is progressing and the testicle atrophying.

Operation.—The vas deferens is isolated, and either kept so by two fingers of the left hand, or handed over to an assistant who stands opposite to the surgeon. In either case the latter makes the veins prominent by grasping the affected side of the scrotum and protruding the varicocele. An incision about one and a half inches long, is then made over the now prominent varicocele, care being taken to keep well above the level of the tunica vaginalis. The veins are exposed by a few touches of the knife; any formal dissection of the veins being unnecessary. An aneurism needle threaded with catgut is passed below the veins at the lower angle of the wound, and the needle withdrawn. The same procedure is repeated at the upper angle of the wound, only about two-thirds of the veins being included in the ligature, otherwise gangrene will follow.

Both ligatures are tied down tight and the intervening portion of the veins cut away. One end of each ligature is now cut close to the knot, and tie the two remaining long ends together so as to approximate the stumps of the divided veins thus shortening the cord on that side. The wound is closed by two or three silkworm gut sutures, dressed antiseptically, and the patient kept in bed for at least one week.

Anatomy of the Testicle.



Minute Anatomy of the testicle.

Varicocele.

Orchitis.

When the scrotum is preternaturally long, the redundant portion should be excised, using a clamp for the operation

Hydrocele of the Spermatic Cord.

Hydroceles of the cord are less frequently met with than the periorchitic variety, and consist of an accumulation of clear fluid similar to that of the tunica vaginalis.

Varieties.—(1) Congenital. (2) Diffuse. (3) Encysted.

Congenital Hydrocele of the Spermatic Cord.

This is a rare affection, the result of an anatomical defect; the funicular process being closely adherent to the cord at the external abdominal ring, but remains open above communicating directly with the abdominal cavity.

Symptoms.—The presence of a soft, fluctuating tumor in the canal, prominent when the patient is in the erect posture and diminished or slowly disappears with the patient in the recumbent posture. When the patient resumes the erect posture the tumor slowly returns. There may be an impulse on coughing in this variety of hydrocele. When prominent enough the surgeon may be able to apply the transmitted light test.

Diagnosis.—Congenital hydrocele must be distinguished from an inguinal hernia.

In hernia the tumor disappears suddenly and completely and with the characteristic flop and a gurgle when taxis is applied; coughing brings it back quickly. Hydrocele disappears slowly and requires considerable time for its complete return. The transmitted light test is pathognomonic of hydrocele.

Treatment.—A truss may be applied, and is occasionally followed by cure; failing in this an antiseptic seton should be employed.

Diffuse Hydrocele of the Spermatic Cord.

A collection of fluid in the cellular tissue which surrounds the cord.

Symptoms.—An elongated, cylindrical or ovid swelling, usually extending from the testicle to the internal abdominal ring, filling the inguinal canal. The swelling is soft, compressible and fluctuating, and the tumors move with the spermatic cord. When of sufficient size translucency may be observed by the proper use of the light test.

Diagnosis.—Diffuse hydrocele must be distinguished from omental hernia.

Omental Hernia.	Diffuse Hydrocele.
Impulse on coughing.	No impulse on coughing.
Reducible.	Irreducible.
Doughy to the touch.	Fluctuating to the touch.
Does not transmit light.	Does transmit light.

Treatment.—When of sufficient size to cause some inconvenience to the patient, the aspiration and iodine injection may be tried. In the majority of cases it is better to open the sac and drain as for hydrocele of the tunica vaginalis.

Encysted Hydrocele of the Spermatic Cord.

An accumulation of fluid between the funicular and vaginal processes.

Symptoms.—It appears as a circumscribed ovoid swelling at some point of the cord, projecting chiefly in front of the latter, transmitted light shows the tumor to be translucent.

Diagnosis.—Encysted hydrocele may be mistaken for hernia; there is no impulse on coughing, gurgling, nor resonance, besides being irreducible. The light test will usually clear up the diagnosis.

Treatment.—Encysted hydrocele occassionally disappears spontaneously, otherwise the open operation with drainage should be carried out.

The Testicles.

Anatomy.—The testicle is a compound tubular gland, surrounded by a serous pouch known as the tunica vaginalis, and contained in the scrotum. The left testicle is usually placed somewhat lower in the scrotum than the right.

The *epididymis*, composed of about twenty feet of convoluted tubes, is about one and a quarter inches in length, attached to the posterior border of the gland, is divided into a globus major or head, above, a body, and a globus minor or tail, below, which is continuous with the vas deferens.

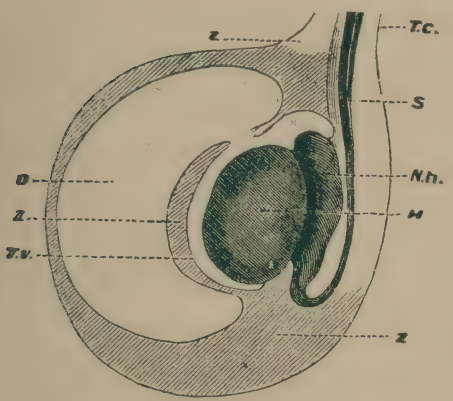
The testicle is at first an abdominal organ, lying below the kidney. It is connected by unstriped musular fibres, the guber-

Hydrocele of the cord communicating with the tunica vaginalis testis. The instrument is passed through the membrane which separates the fluid from the peritonæum. *a*, Testis.

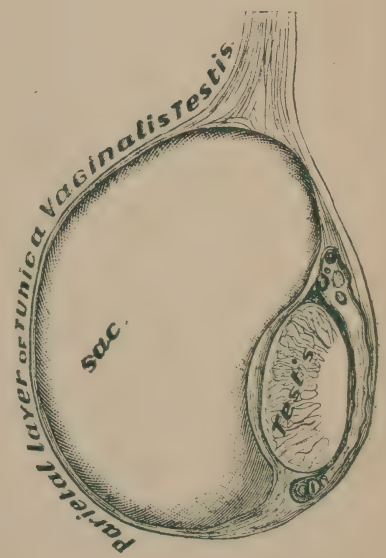
Hydrocele of the cord communicating with the peritoneal cavity. *a*, Testis.

Encysted hydrocele of the cord.

Hydrocele of the tunica vaginalis testis.



Bilocular hydrocele. *T c*, Parietal layer of tunica. *S*, Spermatic cord. *N h*, Epididymis. *H*, Testis. *D*, Cavity of diverticulum. *T v*, Cavity of the tunica vaginalis proprius. *Z z*, Inflammatory new formation between the visceral and parietal layers.



Usual form of hydrocele.

naculum, with the pillars of the external ring and the base of the scrotum. It begins to descend in the early part of the third month of fœtal life, reaching the internal abdominal ring within the sixth month. At the eighth month, it appears at the external ring, and reaches the base of the scrotum shortly before birth.

Undescended Testicle.—The absence of one or both testicles from the scrotum is no evidence that these organs do not exist, as they remain undescended, either in the abdomen or in some part of the inguinal canal.

The left testicle is more frequently undescended than the right. In several reported cases the testicle has been found in the perineum, and in the femoral canal.

When the testicle is permanently detained in its unnatural position, it generally remains undeveloped, and is particularly liable to such complications as inflammation, and malignant disease, especially sarcoma.

Diagnosis.—When the testicle is in the inguinal canal it may be confounded with hernia, the absence, however, of the testicle from the scrotum, its ovoid shape, irreducibility, and the sickening sensation produced when the tumor is compressed will distinguish it from hernia.

When situated in the region of the groin it might be confounded with bubo, especially when the seat of inflammation. If the scrotum were found empty on the affected side, the swelling, in all probability, would be testicle.

Treatment.—When the gland still remains in the abdomen, nothing can be done by surgical intervention, as its attachments are so short that it could not be dragged down into the scrotum.

When situated in the inguinal region, an effort should be made to cause its descent by gently dragging it downward. Its return to the canal is prevented by protecting the ring with a truss having a very soft pad. Should a hernia follow the testicle, the truss will answer the double purpose of retaining the hernia and preventing the retraction of the gland.

If the testicle cannot be brought down into the scrotum by the sixth year, operation must be considered.

Operation.—An incision is made over the testicle; the

exposed gland is then brought out of the wound, the fibres of the cremaster muscle divided transversely, and the cord gently stretched until the testicle will hang free beyond the external abdominal ring.

The finger is now forced through the loose areolar tissue of the scrotum to its base. The latter is invaginated and fastened to the base of the testicle with two chromacized catgut sutures. The invaginated scrotum is now drawn out, carrying with it the anchored testicle, the deeper tissues closed with catgut, and the tissues of the cord sutured to the pillars of the external ring. A firm antiseptic dressing should be applied.

In the femoral variety of the trouble, the testicle should be reduced into the abdominal cavity and retained in place by a truss.

The perineal variety can occasionally be cured by operation similar to that for the inguinal misplacement.

When high up in the inguinal canal, it should be protected from injury by an appropriate pad or truss.

When seen late in life, castration is always advisable, as the organ is, in all probability, functionally useless.

Orchitis.

An inflammation of the testicle.

Causes.—Gonorrhœa, mumps, tuberculosis, syphilis, and traumatism.

Symptoms.—The testicle rapidly swells, but retains its normal ovoid form, with the exception of being somewhat more flattened. The pain is of a dull, sickening character, often radiating to the hips and back. It may be complicated by acute hydrocele. Occasionally suppuration follows an acute inflammation.

Diagnosis.—Orchitis must be distinguished from epididymitis. In epididymitis the swelling is confined to the posterior aspect of the scrotum, and careful palpation will reveal the enlarged indurated organ behind.

Treatment.—The patient should be confined to bed, the scrotum elevated, and lead water and laudanum freely applied. The bowels should be kept loose by the use of salts, and the pain should be controlled by the use of sufficient morphia.

When an acute hydrocele is present, tapping with a tenotome, allowing the escape of a few drops of fluid, will often instantly relieve the intense pain.

After the acute symptoms have subsided, the testicle should be strapped with strips of adhesive plaster, so as to hasten absorption.

Tubercular Orchitis.

Tubercular orchitis is usually secondary to a like affection of the epididymis, but the organisms may reach the gland through the blood vessels and produce so-called primary infection. It is met with at all ages, although commonly between twenty-five and thirty-five. The disease is often bilateral.

Symptoms.—The gland becomes hard, knotty and irregular in form; there is little or no pain in the early stages of the disease. There is a sense of dragging and weight and a sense of discomfort referable to the back. Sooner or later these nodules become adherent to the skin, soften, and finally rupture spontaneously, leaving fistulous openings, which remain sometimes for years, exhibiting little or no tendency to heal. Not infrequently the disease of the testicle has been preceded by tuberculosis of the lungs.

Diagnosis.—Tubercular testicle is to be distinguished from syphilitic orchitis.

Tubercular Orchitis.	Syphilitic Orchitis.
1. Usually begins in the epididymis.	1. Usually begins in the testicle.
2. Occurs between twenty-five and thirty-five.	2. May occur at any age.
3. Irregular and nodular.	3. Uniform and hard.
4. Suppuration frequent.	4. Seldom if ever suppurates.
5. Sometimes painful.	5. Painless.
6. May be larger than the fist.	6. Always smaller than the fist.

Prognosis.—Occasionally, under favorable circumstances, resolution takes place, which will leave the testicle without serious damage. It may undergo encapsulation and cause no further trouble, or the disease may progress from bad to worse until the entire testicle is destroyed.

Treatment.—The treatment of tubercular testicle consists in the use of iodide of iron, cod liver oil, good food, fresh air, and plenty of sunlight, combined with the local use of iodide of lead ointment.

When not benefited by this treatment, one of the following may be tried:

(1) Lannelongue's injection of chloride of zinc; from three to five drops of a one per cent. solution being injected around the periphery of the tumor every third or fourth day.

(2) Injections of a ten per cent. emulsion of iodoform in glycerine are sometimes valuable. From twenty to thirty drops are injected into the focus of the disease, the needle being introduced at several points, five drops being deposited at each point. These injections are to be repeated every fourth or fifth day, depending upon the violence of the reaction.

(3) The diseased focus when circumscribed may be curetted or excised with good results, except the loss of function of the testicle.

(4) When the disease is progressing, or other measures have failed, castration is to be recommended.

Metastatic Orchitis.

An inflammatory orchitis complicating mumps. One testicle is usually involved, and atrophy is not uncommon.

The symptoms and treatment are similar to acute orchitis.

Syphilitic Orchitis.

A complication of the tertiary stage of syphilis.

Symptoms.—A hard, indurated, somewhat irregular, painless swelling, usually smaller than the fist, and often bilateral are all that are noted.

Treatment.—Internally the biniodide of mercury should be given in doses of one-twelfth of a grain with twenty grains of iodide of potash thrice daily. The iodide should be pushed, and local inunctions of mercurial ointment given.

Tumors of the Testicle.

Tumors of the testicle are rather uncommon, but cysts, adenomata, carcinomata, chondromata, fibromata, myxomata, sarcomata, and dermoids are occasionally found.

Carcinoma is by far the most common tumor affecting the testicle.

Symptoms.—The disease is unilateral, beginning after middle life, first as a uniform swelling, which soon becomes nodular and irregular, growing with great rapidity, and quickly breaking down and ulcerating, leaving a protruding fungus mass.

As the disease advances, the inguinal lymphatics become involved (drain scrotum), and also the lumbar (drain testicle); there is dull, aching pain; the general health rapidly fails, the face becomes cachectic, and the body emaciated.

Diagnosis.—Cancer of the testicle must be distinguished from tubercular orchitis.

Cancer of Testicle.	Tuberculosis of the Testicle.
1. Occurs about age of 50.	1. Occurs between 25 and 35 years.
2. Begins in the testicle.	2. Begins usually in the epididymis.
3. Growth rapid.	3. Growth slow.
4. Becomes adherent to the skin early.	4. Adhering to skin later.
5. Pain sharp and severe.	5. Little or no pain.
6. Attains great size.	6. Never very large.
7. Painless on pressure.	7. Painful on pressure.
8. Unilateral.	8. Often bilateral.
9. Course rapid and fatal.	9. Course slow, extending over a period of months or years.

Treatment.—Early and complete extirpation.

Hydrocele.

A collection of fluid in the tunica vaginalis testis.

Varieties.—(1) Acute. (2) Encysted. (3) Congenital.

Acute Hydrocele.

This condition usually results from an extension of inflammation from the epididymis or testicle.

Symptoms.—Owing to the prominence of the symptoms of the primary disease, the characteristic symptoms of hydrocele are not pronounced.

Pain is often extremely severe, and is due to pressure.

Diagnosis.—The diagnosis usually presents no difficulty if the light test be employed.

Treatment.—Rest in bed, elevation of the scrotum, and the local use of lead water and laudanum, are usually sufficient. After the acute symptoms have subsided a well fitting suspensory should be worn.

When the pain becomes very severe, the sac may be punctured with a fine tenotome and a few drops of serum allowed to escape. Uusually this is followed by instant relief. The local use of belladonna and mercurial ointments will often hasten the absorption of the fluid.

Encysted Hydrocele.

This is the ordinary form of hydrocele, the fluid being contained within the cavity of the tunica vaginalis.

Causes.—In many cases the cause is not appreciable, often it can be traced to traumatism, strains, anatomical defects, or is a complication of orchitis or epididymitis.

Symptoms.—A swelling of slow formation; swelling begins below and ascends; pyriform in shape; smooth, tense, and fluctuating; elastic on pressure, but does not alter its size; dull on percussion; stands away from the body, and cannot be reduced.

When examined by the light test the swelling will be found to be translucent. The patient should be examined in a dark room; a candle or lamp is held on one side of the swelling, the surgeon stoops down on the other side, making the scrotum tense with one hand, while the other is placed in a vertical position on its upper surface, in order to intercept the peripheral rays of light.

Diagnosis.—A hydrocele must be distinguished from a hernia, varicocele, hematocele, sarcocele, and encephaloid of the testicle.

Hydrocele.	**Hernia.**
1. Begins at the most dependent part.	1. Swelling commences at the top.
2. Irreducible.	2. Reducible.
3. Flat on percussion.	3. Tympanitic (gut).
4. Stands away from the body.	4. Does not stand away from the body.
5. Translucent.	5. Not translucent.
6. No impulse on coughing.	6. Impulse on coughing.

Method of applying adhesive straps to the testicle. Evacuating a hydrocele. with a trocar and canula, showing how to avoid the testicle.

Hydrocele.	Varicocele.
1. Unattended with pain.	1. Pain in testicle, inguinal canal and loins.
2. Does not disappear with patient in the recumbent posture.	2. Does disappear.
3. Tumor smooth and regular in outline.	3. Feels like a bunch of worms.

Hydrocele.	Hematocele.
1. Appears idiopathically.	1. Generally results from traumatisms.
2. Stands away from the body.	2. Falls between the legs and feels heavy.
3. Transmits light.	3. Does not transmit light.
4. Fluctuating and elastic.	4. Solid and doughy.

Treatment.—The treatment of a hydrocele is either palliative or radical.

Palliative treatment consists in tapping the sac with a trocar and canula, drawing off the fluid, and repeating this procedure as often as the sac refills.

In tapping a hydrocele the surgeon should grasp the neck of the tumor with the fingers of the left hand so as to make it tense; with the other hand a trocar and canula is plunged into the sac with a firm, quick motion, at the junction of the middle and lower thirds of the scrotum, and in a direction inward and upward, so as to avoid wounding the testicle. It is always well to select a spot on the scrotum free from veins, so as to avoid the possibility of hemorrhage into the loose tissue of the scrotum.

Radical treatment is carried out either by injections or by cutting operations.

Injection.—This method has for its object the causation of an aseptic, adhesive inflammation which will obliterate the sac by adhesions between the walls. Injection is only indicated in thin-walled hydroceles.

The patient should be placed in the recumbent posture, the parts having been prepared antiseptically. A trocar and canula

is plunged into the sac in the usual manner, the trocar withdrawn, and the fluid allowed to escape. It is necessary for the success of this treatment that all fluid be removed from the sac. From one drachm to an ounce of pure tincture of iodine, depending upon the quantity of fluid withdrawn, is to be injected into the sac by means of a syringe with a nozzle accurately fitting the canula. The canula and syringe are now withdrawn as one instrument, the finger placed over the puncture, and the scrotum thoroughly manipulated in order to bring the iodine in contact with all parts of the sac. The puncture is now sealed with gauze and collodion. The patient should be confined to bed for at least a week, and lead water and laudanum applied locally for a few days, in order to counteract the excessive inflammatory reaction, which necessarily follows this plan of treatment. So soon as the acute symptoms subside, the testicle should be strapped to hasten resolution.

The *open operation* is performed by making an incision about one and a half inches in length through the skin, subcutaneous structures and sac. The fluid is allowed to escape; the edges of the sac are sutured to the skin incision, and the cavity packed with a small strip of iodoform gauze to act as a drain. The drain is to be shortened each day, until the cavity is entirely obliterated.

The open operation is indicated in thick-walled hydroceles, and when the iodine method has failed.

Excision of the *sac*, that is the parietal layer of the tunica vaginalis, is sometimes recommended. An incision two and a half inches in length is made over the centre of the swelling dividing all structures down to the sac. The sac is then opened and the edges caught with hæmastatic forceps, and split up with a pair of scissors. It is now separated from the tissues of the scrotum by sponging, and then cut away as close to the epididymis and testicles as possible. All hemorrhage is now controlled, and the wound closed without drainage. A large antiseptic dressing should be applied, and firm compression maintained by the use of a crossed perineal bandage.

The open operation and excision do not necessitate confinement to bed as is the case with the iodine method.

Congenital Hydrocele.

In this form of hydrocele there is a direct communication between the base of the scrotum and the abdominal cavity, the funicular and vaginal processes having failed to close. Like congenital hernia, it may appear at birth or later in life.

Sypmtoms.—History of a tumor of slow formation, dull on percussion, beginning at the lowest point of the scrotum, disappearing when the patient assumes a recumbent posture, but returning slowly when in the erect posture. The light test will reveal translucency.

Such hydroceles are frequently complicated by hernia (congenital hernia).

Diagnosis.—Congenital hydrocele must be distinguished from inguinal hernia.

Congenital Hydrocele.	Congenital Hernia.
1. Begins in the most dependent part.	1. Begins at external ring.
2. No impulse on coughing.	2. Impulse on coughing.
3. Flat on percussion.	3. Tympanitic (gut).
4. Translucent.	4. Not translucent.
5. Disappears slowly with patient in the recumbent posture.	5. Disappear with a flop and a gurgle.
6. Finger over the ring does not prevent the hydrocele from reforming.	6. Hernia is retained.

Treatment.—Occasionally these cases may be cured by the application of a truss, which is often necessary for a co-existing hernia. If this fails, an aseptic seton (seton introduced with all antiseptic precautions) may be tried, or a small drainage tube may be introduced through the sac from side to side. A large antiseptic dressing should be applied and changed frequently. The surgeon should be scrupulously clean in the management of these cases to avoid infection either from the urine or the fæces.

Hematocele.

A collection of blood in the tunica vaginalis.

Causes.—Traumatism, disease, and as a sequel to aspiration for hydrocele.

Symptoms.—The tumor is ovoidal or globular in shape, the largest circumference being below; does not fluctuate; does not transmit light; feels heavy and solid when palpated, and is dull on percussion.

Treatment.—Rest in bed, elevation of scrotum, and the local application of lead water and laudanum. After the acute symptoms have subsided, the testicle should be strapped with adhesive plaster so as to hasten absorption.

When the above measures fail, the tunica vaginalis should be opened as for hydrocele, all clots cleaned out, the cavity irrigated with bichloride solution 1 to 2,000, and the wound packed with iodoform gauze, so that healing takes place from the bottom up.

Spermatocele.

A collection of milky white fluid in the tunica vaginalis containing spermatozoa.

Symptoms and treatment are similar to those applicable to hydrocele.

Epididymitis.

An inflammation of the epididymis.

Causes.—Commonly results from the extension of gonorrhœal inflammation from the posterior urethra through the vas deferens to the epididymis, usually appearing about the fifth or sixth week.

Symptoms.—One of the earliest symptoms is tenderness along the cord, and a hard, swollen state of the vas deferens, and pain in the back. The testicle swells, and becomes exceedingly tender, the patient walking with a stooping posture, with the legs somewhat separated.

On examination, the swelling will be found confined to the posterior aspect of the scrotum, most marked at the inferior border of the gland (tail of the epididymis). Often the disease extends by continuity of tissue to the vaginal tunic, and an acute hydrocele results, with increase in severity of the symptoms.

Suppuration is rare in these cases, the general tendency being always toward resolution. Traces of the attack often remain for a long time after the infection has disappeared, the regular outline of the epididymis being interrupted by masses of lymph.

Prognosis.—The prognosis is always good as regards a cure, but bad as regards the future functional activity of the organ. In the majority of cases of double epididymitis, the patients remain sterile, as the plastic lymph which blocks the tubules is never entirely absorbed.

Treatment.—The patient should be confined to bed, the scrotum elevated, and lead water and laudanum freely applied. In the meantime all treatment directed to the posterior urethra should cease. When the symptoms are severe the hydrocele may be punctured.

After the acute symptoms subside the testicle should be strapped with adhesive plaster, or equal parts of belladonna and mercury ointments applied to hasten the absorption of the lymph, and at the same time from ten to fifteen grains of iodide of potash should be given three times daily for its absorbative action.

Syphilitic Epididymitis.

An inflammation of the epididymis late in secondary syphilis, consisting of small gumatous lesions.

Diagnosis.—Distinguish from tuberculosis of the epididymis. (See tuberculosis.)

Treatment.—Internally, mercury with iodide of potash combined with the local use of inunctions of mercurial ointment.

Tuberculosis of the Epididymis.

The epididymis is a frequent seat of primary tuberculosis, although it often follows tuberculosis of the prostate.

When primary, the infection takes place through the blood. Its preference for the epididymis is explained by the fact that the arteries break up into a fine capillary network to supply the spongy tissue of the epididymis, the current of blood is slowed and the tissue soft.

Symptoms.—The disease usually begins in the head of the organ as a series of nodules of slow growth, which finally soften, become adherent to the skin, break down, discharging their con-

tents spontaneously, and leaving a sinus. The testicle is often secondarily involved. The disease is often bilateral.

Diagnosis.—Tuberculosis is to be differentiated from syphilitic epididymitis.

Syphilitic Epididymitis.	Tubercular Epididymitis.
1. Usually affects the right.	1. May affect either.
2. Usually unilateral.	2. Often bilateral.
3. Appears at any age.	3. Appears between 25 and 35.
4. Usually a single nodule.	4. Usually several nodules.
5. No tendency to degeneration.	5. Usually break down.
6. No sinus formation.	6. Sinus formation common.

Treatment.—Same as tuberculosis of the testicle.

Seminal Vesiculitis.

An inflammation of the seminal vesicles.

Causes.—It may be either gonorrhœal or pyogenic, the former being by far the most common cause of the trouble.

Symptoms of acute are those of posterior urethritis.

Diagnosis.—The diagnosis can readily be made by a careful palpation through the rectum, the patient being in a stooping position over a chair.

The usual termination of this affection is in a chronic inflammation, although it sometimes disappears spontaneously when the inflammatory condition of the posterior urethra is cured.

The Symptoms of Chronic Seminal Vesiculitis are those of chronic posterior urethritis. (See gonorrhœa.)

Diagnosis.—The diagnosis is to be confirmed by a rectal examination and the "three glass test."

Take three ordinary conical urine beakers, and have the patient fill the first, then the vesicles are milked by the finger in the rectum, then the second glass is filled, and finally the third; shreds in the second glass will indicate inflammation of the vesicles.

Treatment.—The treatment is that appropriate for acute and chronic prostatitis.

In the chronic variety of the affection, the vesicles should be milked by the finger in the rectum every third or fourth day according to the effect produced, and should be continued over a period of three or four months.

Tuberculosis of the Seminal Vesicles.

Tubercular seminal vesiculitis is rarely a primary affection, being usually secondary to involvement of the prostate.

Symptoms.—The disease is usually bilateral and is characterized by the formation of irregular nodular, indurated masses, readily detected by rectal palpation. There may be some frequency of micturition, painful pollutions, discharges of bloody semen, and finally sterility.

Diagnosis.—The diagnosis can be readily made by rectal palpation, and the examination of the urine and semen for tubercle bacilli.

Treatment.—Occasionally they break down and suppurate, discharging through the rectum, then to heal spontaneously.

In the early stages of the affection, the bowels should be kept regular, the urine should be rendered bland and unirritating, and the same general measures should be adopted as are appropriate for tuberculosis in other parts of the body (cod liver oil, iron, fresh air, etc.).

When the above measures fail and the disease is progressing, excision of the affected vesicle is indicated.

Castration.

The operation for the removal of the testicle.

Indications.—(1) Tumors; (2) tuberculosis; (3) occasionally gumma; (4) extensive suppuration; (5) for the relief of enlarged prostate, and (6) certain cases of undescended testicle.

Operation.—The testicle being made to protrude with the left hand, an incision is made over it from the external ring to the base of the scrotum. When the skin is involved by a growth, two eliptical incisions should be made and the affected skin removed. The testicle with its tunics is now quickly freed from the surrounding tissue and the cord exposed and freed. An aneurism needle threaded with a double catgut ligature is passed through the cord as high up as possible, the loop cut, and the needle withdrawn. The cord is now ligated in each half and once around, and divided fully one-quarter of an inch below the ligature. The divided end of the cord should now be cauterized by an application of pure carbolic acid to prevent infection of

the wound. A few scrotal vessels will require ligature; the wound is then closed with silkworm gut sutures being careful to evert the skin edges (dartos causes inversion).

Vasectomy.

An operation for the excision of a portion of the vas deferens.

Indications.—For the relief of prostatic hypertrophy. Partial excision might occasionally be indicated for the relief of local tubercular deposits.

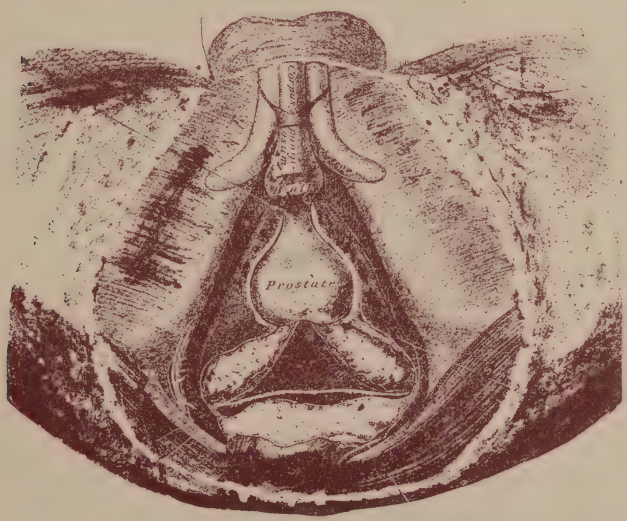
Operation.—Have an assistant to hold the vas between the thumb and finger of each hand, at the same time making it prominent on the posterior aspect of the scrotum. An incision one inch long is made over the vas, and the latter pulled out of the wound by means of a blunt hook. Two catgut ligatures are thrown around the vas about half an inch apart, then tied down tight, and the intervening portion of the tube resected. The ends of the divided tube are cauterized with pure carbolic acid, and the wound closed. The wound may be sealed with a gauze and collodion dressing and the testicles supported in a suspensory bandage.

The Prostate Gland.

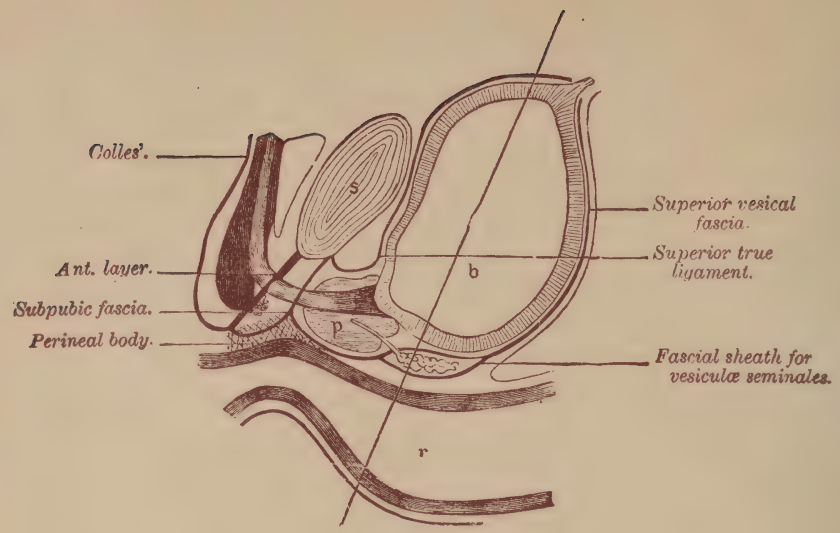
Anatomy.—The prostate is a solid body, partly glandular and partly muscular, embracing the neck of the bladder and surrounding the first portion of the urethra. It weighs about eighteen grammes. It consists of a median and two lateral lobes; the two lateral lobes meeting in front of the urethra are separated from the median lobe, which lies behind the urethra, by the prostatic fissure. The ejaculatory ducts and the uterus masculinus are found in this fissure.

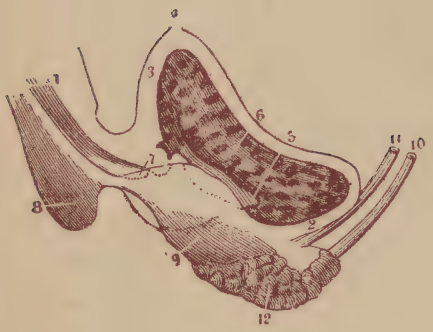
Relations.—By its anterior surface the prostate is in relation with the symphisis pubis. Posteriorly it is in relation with the rectum, through the wall of which it can be felt (corresponding in size to a horse chestnut.) Laterally it is in relation with the levatoranni muscles. The base of the gland is in relation with the bladder, and its apex rests against the posterior layer of the triangular ligament.

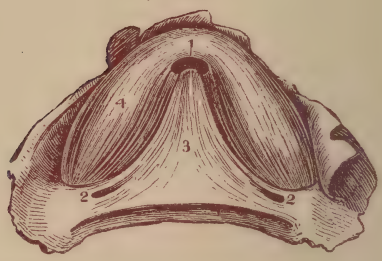
Diagram of parts behind triangular ligament of urethra. Anterior fibres of elevator of anus are hooked down to show part of prostate; the rest is tracked by dotted line. 1, root of cavernous body; 2, bulb; 3, compressor muscle of urethra; 4, membranous part of urethra surrounded by compressor muscle; 5, prostate gland; 6, anterior border of elevator muscle of anus; 7, elevator muscle of anus; 8, artery of bulb; 9, internal pudic artery.

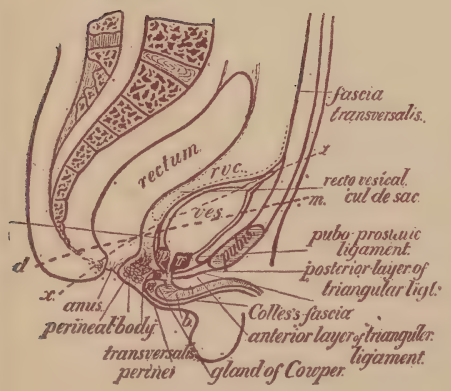


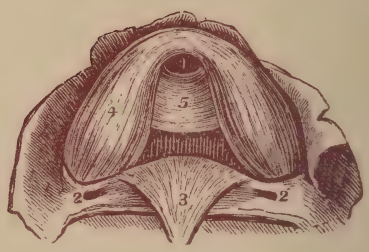
Anatomical relations of Prostate and Seminal vesicles.











Vesical Sphincter.

Prostatitis.

Inflammation of the prostate gland.

Varieties.—(1) Acute. (2) Chronic.

Causes.—*Acute*—exposure to cold and wet; acute gonorrhœal infection; as a complication of acute febrile diseases; pyæmia; septic thrombo-phlebitis of the prostatic plexus of veins; traumatism; the introduction of dirty instruments, and by contiguity of tissues from the rectum.

Chronic.—Repeated attacks of acute inflammation; chronic posterior urethritis; vesical and prostatic calculi, and masturbation.

Symptoms.—*Acute*—feeling of weight and fulness in the perineum (sensation of a hot ball); frequency of micturition with vesical tenesmus, followed by dysuria and often retention. There is pain on urination and defecation; tenderness in the perineum on pressure, and mild constitutional symptoms (fever, malaise, etc.).

Examination per rectum produces intense pain, and the prostate is found to be enlarged, soft, and hot.

When an abscess forms fluctuation can often be detected by palpation of the gland through the rectum.

The majority of prostatic abscesses rupture spontaneously into the urethra; they may rupture into the rectum, bladder, or recto-vesical space,

The *chronic* variety is usually associated with frequency of micturition; vague pains through the perineum, the discharge of a few drops of a clear, viscid fluid, especially after defecation. There is some pain during defecation; nocturnal pollutions; impotence, and sexual hypochondriasis.

Palpation through the rectum shows the prostate to be large, soft, and flabby.

Diagnosis.—Acute prostatitis is to be distinguished from cystitis (see cystitis), and cowperitis.

In cowperitis there will be two indurated swellings on either side of the median line of the perineum, and the absence of all rectal symptoms which are associated with prostatitis.

Chronic prostatitis may be mistaken for chronic posterior urethritis, but may be distinguished in the following manner: Request the patient to empty about one-third of the urine con-

tained in the bladder into a conical urine glass; then milk the prostate and the second third to be passed into a second glass, the last portion into a third glass. The first glass will contain the washings of the anterior urethra; the second, the secretion of the prostate, and the third, shreds from the posterior urethra.

Treatment.—(1) *Acute*—Rest in bed with the hips elevated; leeches, ice or hot fomentations to the perineum; milk diet and the internal administration of

℞. Tincturæ aconiti . . gtts. xxiv
Tincturæ belladonnæ . fʒi
Acidi boracici . .
Sodii bromidi . . āā ʒii
Liq. potassii citratis q. s. ad fʒvi
M. S. fʒss every four hours.

If retention should occur, it should be relieved by the introduction of a very small Nelaton catheter.

When an abscess forms, a median perineal incision should be made and the pus evacuated.

Chronic—All sources of irritation should be removed; full sized steel sound should be passed at intervals of three or four days, combined with prostatic massage and the instillation of ten drops of a one per cent. solution of nitrate of silver in the prostatic urethra. The strength of the silver solution may be gradually increased to five or even ten per cent..

The general health should always be looked after; the diet regulated; constipation relieved; moderate exercise, cold baths, tonics, etc..

Prostatorrhœa.

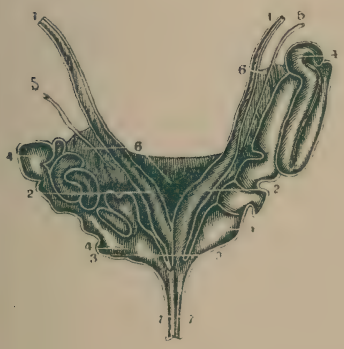
A condition of chronic congestion of the prostate gland, characterized by the discharge of colorless mucoid fluid, which is passed after urination, or from the straining effort necessary to expel the contents of the rectum.

Symptoms.—The most prominent symptom is the discharge of a thin, more or less milky fluid from the meatus, following straining at stool, during the forcible expulsions of the last drops of urine, or even during sneezing or laughing. The quantity

Showing the relations of the floor of the bladder to the prostatic urethra in the normal condition of this body. The bristle is passed from the ejaculatory duct into the urethra.

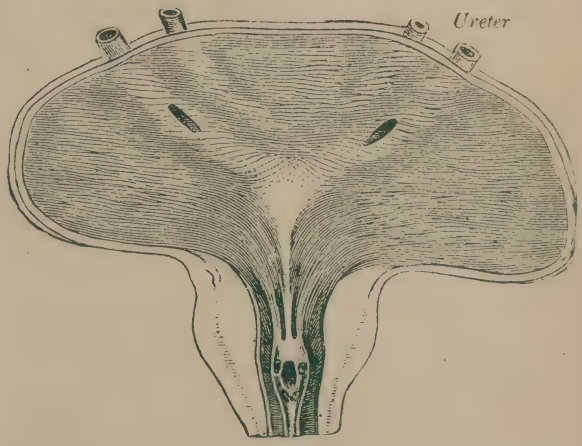
Section through the symphysis pubes, showing relations of prostate to surrounding strictures.

1, pubes; 5, pubo-prostatic ligament: 9, middle lobe of, 10, prostate; 12, left vas; 13, left vesicula; 14 com. ejaculatory duct; 16, prostatic plexus receiving 17, dorsal vein of penis; 19, bulb; 20, Cowper's gland.



A Vertical Section of the Union of the Vas Deferens and Vesiculæ Seminales so as to show their Cavities.

1,1. Vas Deferens with thick Parietes and narrow Cavity.
2.2. Portion of the same where the Cavity is enlarged.
3.3. The Extremities of the Vas Deferens from each side where they join the Vesiculae Seminales and Ductus Ejaculatorius.
4.4, Vesiculae Seminales distended with air and dried.



Bas fond of bladder, ureteral orifices and mouths of the ejaculatory duct.

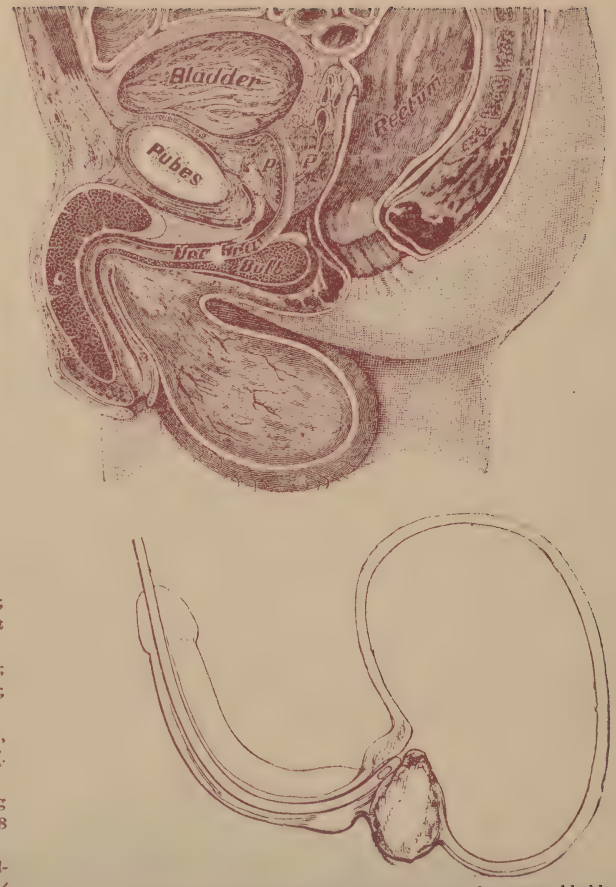
1. Prostate at birth. Width, at base, 4 lines; a little above middle, 5 lines; at apex, 2 lines; length along middle, 4 lines, and at edge, 4¾; thickness at base, 2 lines; at middle, 3¼, and at apex, 1¼. Weight, 13 grains.

2. Prostate at 4 years. Breadth, at base, 6 lines; just above middle, 7; and at apex, 2½; length along middle, 6 lines; and 7 lines at margin; thickness at base, 2¾ lines; at middle, 4; and at apex, 2. Weight, 23 grains.

3. Prostate at 12 years. Width, 8½ lines, at base; 9½ above middle, and 3 at apex; length, along middle, 8 lines, and 8½ at edge; thickness at base, 3; middle, 4½; and at apex, 2¾. Weight, 43 grains.

4. Prostate at 14 years. Width, at base, 11 lines; at middle, 9½; at apex, 4; length, along middle, 8 lines, and 10 at margin; thickness, 3½ at base, 5 at middle, and 3 at apex. Weight, 58 grains.

5. Prostate at 25 years. Width, at base, 18 lines; middle, 20; and apex, 5; length, along middle, 15 lines; and at edge, 18; thickness at base, 9 lines; middle, 10; at apex, 4. Weight, 4½ drachms.



Hypertrophy of median and of lateral lobes of prostate; bladder dilated and thickened; 'prostatic' catheter.

secreted may vary from a slight moisture of the meatus to a teaspoonful in twenty four hours. It may be increased by riding, bicycling, and by over-indulgence in alcoholic and malt liquors. The escape of fluid is occasionally attended by pleasurable sensations. There is usually some irritability, as indicated by the frequency of micturition, and a sense of weight and fulness in the rectum and perineum.

Treatment.—It is a most obstinate affection unless subjected to early and persevering treatment.

All sources of local irritation, such as internal and external hemorrhoids, stricture, phimosis, etc., must be removed. The same general hygienic regimen should be followed as is indicated for chronic prostatitis.

Internally atropia and ergot have proven of great value, and when combined with prostatic massage and instillations of silver nitrate, a cure usually follows.

In order to bring such a case to a successful termination, it is often necessary to assure the patient that the discharge is not seminal fluid.

Hypertrophy of the Prostate.

An enlargement of excessive nutrition independent of inflammatory changes. Essentially senile, rarely seen under fifty years, although it may begin earlier.

Frequency.—Although hypertrophy of the prostate is often met with in aged persons, its relative frequency is greatly overestimated; about one in three men over fifty-five have some enlargement of the postate, but only about one in seven have any symptoms of obstruction; not more than one in fifteen or twenty men who live beyond fifty-five years of age can be expected to require treatment for this affection.

Causes.—*Guyon* claims that hypertrophy of the prostate is a part of a general condition peculiar to advancing years, characterized by extensive degenerative changes, and by the over production of fibrous tissue; a general arterial sclerosis, not limited to the vessels of the genito-urinary system, but when occurring in them, producing both the prostatic hypertrophy and the rigid feeble bladder.

In opposition to this theory we have the statement of Griffiths and Moullin that the original growth is glandular and that the fibroid changes seen are in the nature of degenerative changes; therefore, while fibroid changes are consistent with atheroma, glandular hypertrophies do not occur as a result of arterial sclerosis.

Harrison says the primary changes take place in the bladder, and the depression of the posterior wall, which is said to occur as the bladder sinks into the pelvis with advancing years, precedes prostatic obstruction, and is compensated for by the development of a muscular ridge between the orifices of the ureters, tending towards the obliteration of this pouch. As these muscular fibres are continuous with those of the prostate, hypertrophic changes affecting these muscles must also affect the prostate.

Such a theory must be incorrect because from an embryological study of the prostate, it is undoubtedly a sexual and not a urinary organ.

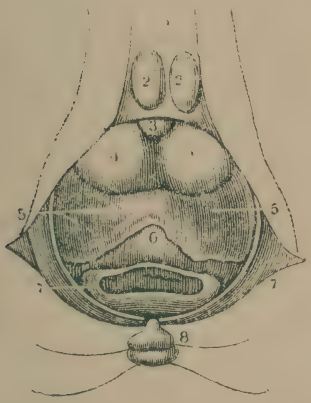
Velpeau supposed the enlargement to result from a form of fibro-myoma analagous to those of the uterus.

The third theory seems to suggest the most probable cause of the enlargement, especially if we consider the prostate belonging to the sexual and not the urinary group.

Varieties.—Hypertrophy of the prostate may be one of three kinds:—(1) Overgrowth of the glandular elements (adenoma). (2) Overgrowth of the stroma (myoma). (3) A combination of the two (adeno-myoma), the muscular elements being finally converted into true fibrous tissue, and the glandular acini destroyed. In rare cases, hypertrophy is complicated by cystic changes in the remains of the Ducts of Müller. The second or myomatous enlargement is the most common, the hypertrophied muscle fibres rapidly becoming converted into fibrous tissue.

The part affected with enlargement very much influences the results in relation to the function of micturition. It is by no means necessary that the natural size of any portion should be much exceeded in order to produce severe symptoms. On the other hand, you may have a very large prostate, and may have almost no symptoms.

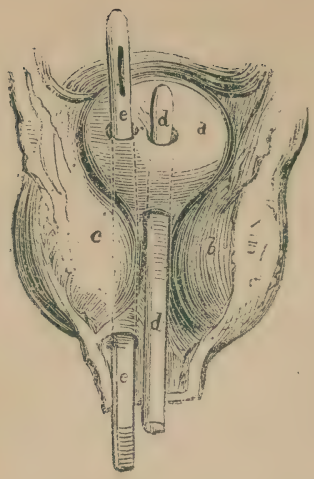
Transverse section of normal prostate, showing microscopical stricture.



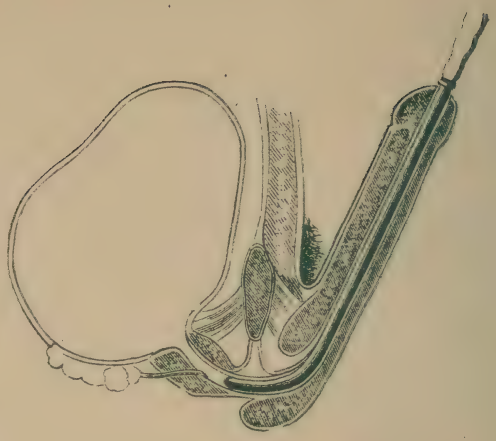
The relative Position of the Prostate, Vesiculæ Seminales and Bladder, as seen after the removal of the Perineal Muscles.

1. Section of the Urethra.
2. Prominences formed by the Bulb of the Urethra.
3. Membranous Portion of the Urethra.
4. Prostate Gland.
5. Vesiculæ Seminales.
6. The Bladder lying upon the the Rectum.
7. Section of the Rectum.
8. Portion of the Coccyx.

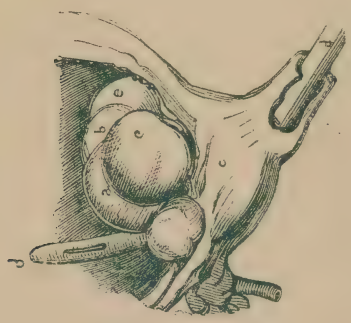
Longitudinal section of hypertrophied prostate, in a patient seventy-four years of age; showing a false passage tunneled by a catheter. *b*, Line of transverse section shown in Fig. 600. *a*, Duct of vesicula seminalis.



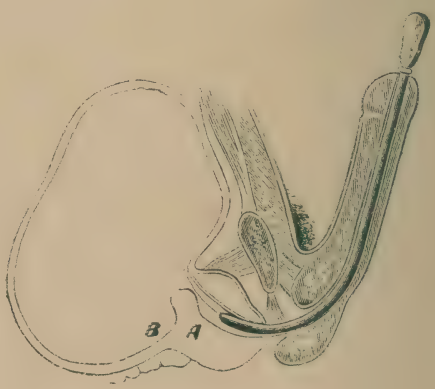
Two instruments appear transfixing the prostate, of which body, the three lobes, *a*, *b*, *c*, are much enlarged. The instrument *d* perforates the third lobe *a*, while the instrument *e* penetrates the right lobe *c*, and the third lobe *a*. This accident occurs when instruments not possessing the proper prostatic bend, are forcibly pushed forwards against the resistance at the neck of the bladder.



The sound passing around the normal curve of the urethra.



The prostate presents four lobes of equal size, and all projecting largely around the neck of the bladder. The prostatic canal is almost completely obstructed, and an instrument has made a false passage through the lobe *a*.



Showing the increase in the curve of the urethra in prostatic hypertrophy, and the necessity of a longer curve in the catheter.

The enlargement may vary from that of a plum to that of a cocoanut; it may involve the entire organ; it may be limited to one lobe; to two lobes, and may extend backwards and upwards towards the bladder or towards the rectum. In 60 per cent. of cases, the enlargement is symmetrical; in 15 per cent. the median lobe is involved; in 8 per cent., the left lobe, and in 6 per cent., the right lobe; in 4 per cent., both lateral lobes; in 2 per cent. the anterior commissure.

Effect on Urethra and Bladder.—As the apex of the prostate is attached to the posterior layer of the triangular ligament, any enlargement of it is followed by an increase in its long diameter. As a result, the prostatic urethra must be lengthened, and the neck of the bladder is carried upwards and backwards, producing the so-called *post-prostatic pouch.* It, therefore, follows that the urine which collects in this pouch cannot be voided by voluntary efforts. The constant desire to micturate occasioned by this collection of urine, causes a hypertrophy of the muscles of the bladder, and a sacculation of those parts of the organ not supported by muscle fibres. In many cases the increase in pressure on the bladder results in a preternatural thinning of bladder walls and atony.

The presence of residual urine predisposes to cystitis and the development of calculus, and, if not relieved, will cause ascending pyelonephritis,

Symptoms.—(1) *Undue frequency of micturition,* particularly at night. The residual urine and the congestion about the neck of the bladder are the causes of this symptom. It is not pronounced during the day, even though the patient may occupy the same position as in sleeping. It is highly probable that as a result of the enlargement the function of the vesical sphincter is somewhat interfered with, so that the relaxation during sleep allows a few drops of irritating urine to escape into the prostatic urethra, which, being in a congested and hyperæsthetic state, occasions the urgent desire to urinate.

(2) *Difficulty in starting the stream,* due to irritability of the vesical sphincter.

(3) *Loss of the parabolic curve.* In enlarged prostate the

stream drops vertically from the penis; is due first, to the obstruction caused by the enlarged gland, and secondly, to the paralysis of the detrusor muscles from over-distension.

(4) *Interrupted stream*, due to the ball valve action of an enlarged middle lobe.

(5) *Dribbling* at the end of micturition, because the wave of contraction, which should be continuous from the bladder, is interrupted by the enlarged gland, and the stream is broken.

As the prostate increases in size the *incontinence of retention* or *complete retention* of urine may follow.

As the enlargement progresses the bladder becomes invaded with virulent organisms, either from the introduction of dirty catheters, or from the kidneys, or by contiguity of tissue, from the rectum, and cystitis results. The urine undergoes ammoniacal fermentation, becomes exceedingly foul, and is loaded with pus and mucus.

With the local symptoms, the patients often complain of pain on urination and defecation, and vague pains about the loins, hypogastrium, and inner side of the thighs.

Objective symptoms.—(1) *Residual urine.*—The patient should be requested to urinate, and then a Nelaton catheter should be introduced into the bladder; the urine that is drawn off is termed residual urine.

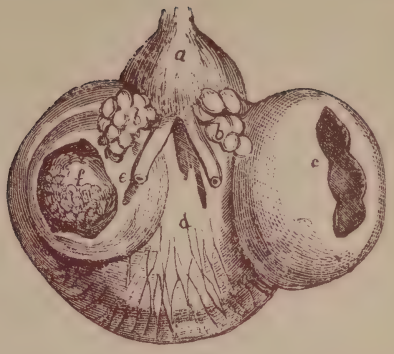
(2) *Palpation by the rectum.*—The patient should be placed in the semi-recumbent posture with the legs drawn up and the thighs separated, the middle finger of the right hand being prepared, is inserted into the rectum and the gland carefully explored. Digital exploration will only show the amount of lateral and posterior enlargement.

(3) *By the use of instruments*, the length of the prostatic urethra, the seat and nature of the obstruction, and the tonicity of the bladder may be ascertained.

Treatment.—The treatment of enlarged prostate may be considered under the following headings:

I. Palliative.	*A. Hygienic.* *B. Medicinal.* *C. Instrumental.* *D. Miscellaneous.*	**II. Radical.**	*A. Prostatotomy.* *B. Prostatectomy.* *C. Castration.* *D. Vasectomy.*

"The lateral lobes of the prostate, *e d*, are enlarged, and contractthe prostatic canal. Behind them, the third lobe, of smaller size, occupies the vesical orifice, and completes the obstruction. The walls of the bladder have hence become fasciculated and sacculated. One sac, *a*, projects from the summit of the bladder; and another, *b*, containing a stone, projects laterally. When a stone occupies a sac, it does not give rise to the usual symptoms as indicating its presence, nor can it be always detected by the sound."



"The two sacs appear projecting on either side of the base of the bladder. The right one, *e*, contains a calculus, *f*; the left one, *c*, larger dimensions, is empty. The rectum lay in contact with the base of the bladder, between the two sacs.

"The three lobes, *a*, *b*, *c*, of the prostate are enlarged, and of equal size, moulded against each other in such a way that the prostatic canal and vesical orifice appear as mere clefts between them. The three lobes are encrusted on their vesical surfaces with a thick calcareous deposit. The surface of the third lobe, *a*, which has been half denuded of the calcareous crust, *b*, in order to show its real character, appeared at first to be a stone impacted in the neck of the bladder, and of such a nature it certainly would seem to the touch, on striking it with the point of sound, or other instrument."

Hygienic.—The general or constitutional treatment of the patient is not to be disregarded. One of the main objects is to prevent the local congestion of the organ, such as would be induced by chilling of the surface, wet feet, sitting on cold seats; too much excitement, sexual or otherwise. The bowels should be kept regular by regulating the diet, moderate exercise and the occasional use of salines or mercurials. The diet should be good, plain, but nutritious, avoiding tea, coffee, spices, highly seasoned articles, pastries, rich dressings, and very acid fruits. In the majority of cases the use of alcohol had better be interdicted, especially malt liquors; in certain cases where the patient is feeble, with a tendency to hypostatic congestions, the moderate use of well diluted Scotch whisky will probably do the minimum amount of harm.

Medicinal.—With the exception of ergot, there is no remedy on which the slightest reliance can be placed to influence the hypertrophy in the smallest degree. It should be administered through a long period, and when the urine is irritating, it may be combined to advantage with salol and boracic acid. When there is much vesical irritability the following may be administered:

℞ Tr. Belladonnæ . . . fʒss
Acid boracici . . .
Sodii bromidi . . āā ʒij
Liq. potassii citratis q. s. ad fʒvi
M. S. fʒss every four or six hours.

As is the case with all obstructive conditions, there is great danger of the loss of vesical tonicity. This should be prevented by the use of strychnia 1/20 of a grain three times daily. When the urine is hyperacid it should be corrected by the use of citrate of potash, bicarbonate of soda, the proper regulation of the diet, and the rather liberal use of pure water. When the urine is alkaline, benzoic acid should be given in doses of fifteen grains three times daily.

Instruments.—These include the regular use of a full-sized sound passed at intervals of a week, so as to maintain the normal caliber of the prostatic urethra.

The same result can be attained by the use of one of the various prostatic dilators.

In the majority of cases of prostatic hypertrophy more or less urine which collects in the post-prostatic pouch, cannot be passed by the voluntary efforts of micturition. It is therefore necessary to have recourse to catheterization, the best instruments being the Nelaton or the Mercier. These instruments should be used with great care and with the strict precautions as to antisepsis as are given under the head of catheterization (see page 27). As a routine the catheter should be passed half as many times a day as there are ounces of residual urine.

When cystitis is present, it should be treated according to rules given under that heading (see page 29).

Miscellaneous.—Under this heading are included the various parenchymatous injections (ergot, acetic acid, etc.), electro-puncture, massage, etc. Although these measures may be followed by temporary reduction in the size of the prostate, they are exceedingly dangerous, and may even be followed by abscess formation or sloughing.

Radical treatment.—Under the head of radical treatment, are included all those forms of operations applicable directly or indirectly to the enlargement.

Prostatomy.

An incision into the prostate was first devised for the relief of a condition known as "bar at the neck of the bladder," and may be done either through the urethra or through the perineum.

Method of Bottini.—An instrument shaped not unlike a lithotrite, having a concealed platinum knife, which may be heated by electricity, is incased in double tubes through which a stream of water flows to keep it cool. It is introduced into the bladder like an ordinary sound, then the beak turned around one hundred and eighty degrees, and brought in contact with an enlarged middle lobe or bar. The knife is now heated and pulled through the median line of the hypertrophied mass for two or three centimeters, and then pushed back into the bladder until cool. This same manipulation may be repeated upon the superior aspect of the growth. Many successful cases are reported by Bottini, but the method has not yet been generally adopted in this country.

Section through an enlarged prostate and vesical neck, showing obstruction (*a*) and the post-prostatic pouch.

Hypertrophy of the prostate, showing the asymmetrical development of the middle or third lobe. *a a*, Openings of ureters.

The perineal method consists in opening the urethra at the apex of the prostate gland through the perineum, and dividing the obstruction by a blunt pointed knife.

Prostatectomy.

Excision of the prostate may be done in three ways, urethral, perineal, and suprapubic.

Perineal Prostatectomy.

This operation is indicated for the removal of suburethral growths, in extra-vesical enlargements of the lateral lobes, where the patient is feeble, where the bladder is atonic and contracted, and rigid, and where there is cystitis, in cases where the surgeon desires to secure drainage.

It has the serious drawbacks of giving very little room; by it the operation is performed in the dark; in patients with a deep, fat perineum the "perineal distance" may make it quite impossible for the operator to get into the bladder and do anything to the obstructing median and lateral lobes.

Operation.—The ordinary median or transverse perineal incision may be made and the prostate exposed as in the operation of perineal lithotomy. The prostate should be explored through the artificial opening, and if a median outgrowth or isolated tumors are discovered, the prostatic sinus should be dilated or the prostate incised laterally and enucleate or excise according to the conditions present. Pedunculated outgrowths can be removed with the small wire snare. A large Nelaton catheter should be introduced through the perineal wound into the bladder and retained in place for from three to five days.

Suprapubic Prostatectomy.

This operation is indicated (1) where one or more calculi co-exist with enlarged prostate; (2) in the firm fibrous varieties of hypertrophy, and (3) when a patient refuses double castration.

Operation.—The preliminaries are similar to those for any ordinary suprapubic cystotomy. The quantity of water injected into the rectal bag (especially when the prostate is abnormally hard), should not exceed six or eight ounces. Where the bladder is contracted, with thick, non-distensible walls, it is

usually inadvisable to perform this operation. A catheter left in the bladder, until the latter is opened, expedites the operation. Enucleation is to be performed as far as possible by the finger; this not only prevents hemorrhage, but the finger will turn out far more intelligently, safely, and quickly, much larger pieces than any forceps. The edges of the bladder incision are secured to the subcutaneous abdominal structures by two sutures on each side.

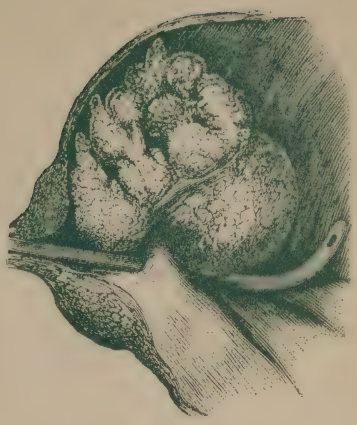
The mucous membrane over the growth is divided with a pair of long-handled scissors, then the index finger of the right hand is slipped into this opening, while at the same time an assistant makes firm counter-pressure against the perineum. With the finger in the bladder the obstruction is enucleated *en masse*, or piece by piece. The operation should be continued in every case until all the lateral and median hypertrophies, as well as all hypertrophies along the line of the prostatic urethra, have been removed.

After the operation has been completed, Guyon's double tubes (two long drainage tubes caliber of fifteen French), are introduced into the base of the bladder through the abdominal incision, and the latter united around the tube by a superficial and deep row of sutures, leaving sufficient room for the introduction of a strip of iodoform gauze behind the symphisis pubis in order to drain the Space of Retzius. This should be removed in from forty-eight to seventy-two hours.

The after treatment consists in keeping the wound thoroughly aseptic and daily irrigations of the bladder with warm boracic acid solution (15 grains to the ounce).

If the enucleation of the prostate occasions excessive hemorrhage, Cabot's tampon may be used. This is a long strip of gauze, of appropriate width (the edges of which should be rolled in and stitched to avoid loose, frayed edges), should be folded back and forth upon itself to form a pad of sufficient size. The folds are shorter each time so as to produce a conical shaped pad; for the same reason the strips of gauze should be broader at one end than the other by two inches. A silk thread attached to a button, is passed through the centre of all the layers of

"Exhibits the lobes of the prostate greatly increased in size. The part *a*, *b*, girds irregularly, and obstructs the vesical outlet, while the lateral lobes, *c*, *d*, encroach upon the space of the prostatic canal. The walls of the bladder are much thickened."



Sarcoma of the prostate and neck of the bladder, with obstruction. The catheter has tunneled the neoplasm.

On the left side.—"Two bougies, *d*, *e*, are seen to enter the upper wall of the urethra, *c*, anterior to the prostate, *a*, *b*. This accident happens when the handle of a rigid instrument is depressed too soon, with the object of raising its point over the enlarged lobe of the prostate."

"In this case an instrument, *d d*, after passing beneath part of lining membrane *e e*, anterior to the the bulb, penetrates *b*, the right lobe of the prostate. A second instrument, *c c*, penetrates the left lobe. A third instrument, *f f*, is seen to pass out of the urethra anterior to the prostate, after transfixing the right vesicula seminalis external to the neck of the lobe, enters this viscus at a point behind the prostate."

the pad from the surface, having the smaller to that having the larger diameter, so that the button is at the extremity of the gauze strip representing the last fold. The thread is to be carried through a perineal opening or through the urethra and securely tied around a roll of gauze at the meatus to keep the pad in place. The pad should have another thread attached to its upper extremity to facilitate its removal.

Urethral prostatectomy should never be advised, as it necessitates working in the dark, and is necessarily limited as a surgical procedure.

Castration for Hypertrophied Prostate.

In 1892 it was suggested by White that there existed an analogy between uterine fibro-myomata and prostatic overgrowth, and that castration might have the same effect upon the prostate gland as oöphorectomy does upon the uterus, causing a shrinkage or atrophy, resulting in a practical disappearance of the enlargement. At the request of Prof. White, I carried out a series of experiments with the following result;

For control experiments thirty-five dogs and their prostates were weighed, and the average weight taken as a standard.

The average weight of the atrophied prostate gland in the eleven dogs experimented upon was 3.920 grammes. If we compare this average with the average weight of the normal gland, which was 15.347 grammes, we find that the average loss of weight consequent upon castration to be 11.458 grammes, and later operations on the human subject were followed by like otraphic changes. All of the most troublesome symptoms are relieved, in seven out of eight cases. The cystitis is relieved in over half. The bladder regains its tone in about two-thirds. The cases in which it fails to lessen the size of the prostate are very few. It is reduced much below normal in many and to normal in half.

Before recommending castration ascertain (*a*) the general condition of patient; (*b*) age; (*c*) sexual power; (*d*) condition of kidneys; (*e*) amount of pain; (*f*) size and consistency of prostate; (*g*) examine urine (character, amount, etc.); (*h*) has the catheter been used; how often; amount of pain; was introduction difficult? (*i*) what is the amount of residual urine?

Indications for Castration.

Castration is indicated in large soft prostate, when the patient is advanced in years, with absence of sexual power, large amount of residual urine, marked cystitis and catheterization difficult.

If castration is refused, vasectomy may be tried, although the results are not as prompt or as satisfactory.

In case of calculus and prostatic hypertrophy co-existing without other complication, if castration or vasectomy is indicated, the operation should be performed first and after the prostate has atrophied, the stone dealt with according to the indications of the case. If prostatectomy is indicated remove both by suprapubic operation.

Prostatectomy is indicated when catheterization is difficult or painful in the younger class of cases in good general condition, kidneys sound, sexual power retained, and in the fibrous variety of hypertrophy.

Vasectomy is indicated in low state of vitality, old age, bad kidneys, etc., where other operations would not be well borne.

Palliative treatment is indicated when prostate is not much enlarged; pain not severe; urine normal; catheter has not been used; residual urine less than four ounces; general health good; sexual power retained.

Palliative treatment consists in diet; general hygiene; dilatation of prostatic urethra; use of catheter when amount of residual urine is excessive; use catheter only when necessary, as, unless thoroughly aseptic, cystitis will be added to the other troubles, or may cause hyperæsthesia of urethra, which would seriously interfere with its continued use.

As landmarks for treatment the following will be useful:

Enlargement Moderate.—Pain little if any; small quantity of residual urine of normal appearance; use of catheter has not yet been necessary. *Treatment*—(1) palliative; (2) prostatectomy; (3) vasectomy; or (4) castration, according to the indications of the case.

Considerable Enlargement.—Diameter, 2 inches about;

urination frequent; catheterization more or less difficult and painful. About eight ounces of muco-purulent or fetid residual urine. *Treatment*—(1) vasectomy; (2) castration; (3) prostatectomy (see indications).

Serious Enlargement. — Diameter 3 inches, more or less. Catheter introduced with difficulty, and causes considerable pain; may be complete retention of urine; marked cystitis; general condition poor; kidneys probably diseased (from backward pressure). *Treatment*—(1) castration; (2) vasectomy, etc., as indicated.

Extreme Enlargement. — Bladder atonic and dilated; complete retention of urine; introduction of catheter *very difficult;* bad cystitis; patient old; general condition very poor (toxæmia). *Treatment*—castration, etc., (see indications).

Tuberculosis of the Prostate.

Tuberculosis of the prostate while usually secondary to tubercular affections of other organs (kidney and testicle), is occasionally seen as a primary condition.

The disease usually occurs between the ages of twenty and thirty-five.

Primary nodules in the vicinity of the tubules become confluent, undergo caseation, forming large soft masses in one or both lateral lobes, the middle lobe being seldom affected. As is the case in other parts of the body, these caseous collections may rupture externally (bladder, urethra, perineum, and rectum). Occasionally, instead of breaking down, there is an overgrowth of connective tissue about the deposits, the contents become imprisoned, and the whole becomes converted into a calcareous mass.

Symptoms.—Undue frequency of micturition, attended with a burning, shooting pain; pain in the perineum; occasionally a slight muco-purulent discharge escapes from the urethra. Hæmaturia is often present, and in the later stages, incontinence of urine may be a prominent symptom from infiltration of the vesical sphincter. Tubercle bacilli may occasionally be found in the urine.

The *constitutional symptoms*, anæmia, emaciation, and an evening rise of temperature.

Treatment.—In the early stages, active antitubercular treat-

ment should be instituted, such as cod liver oil, iodide of iron, good food, fresh air, and sunlight. Injections of emulsion of iodoform in glycerine may be tried (through the perineum). Lannelongue's chloride of zinc solution may also be tried, the prostate being exposed through a median perineal incision.

In advanced cases, a median or tranverse perineal incision should be made, the caseous pockets opened, and the contents thoroughly removed with a curette.

Prostatic Calculi.

Calculi are occasionally seen in the prostate gland. There may be a single large calculus, or they may exist in great numbers, varying in size from a grain of sand to that of a pea.

Causes.—These bodies are formed in the prostatic ducts and acini, mucus being the nucleus.

Symptoms.—When small they may occasion no symptoms, when large, the symptoms are similar to those occasioned by any prostatic obstruction.

Diagnosis.—The diagnosis can usually be made by palpation through the rectum or by the introduction of a vesical sound.

Treatment.—When large enough to occasion symptoms a median lithotomy should be done, and the calculus removed with forceps through the perineal incision. I have seen calculi removed from the prostatic sinus by the urethral forceps of Matthieu.

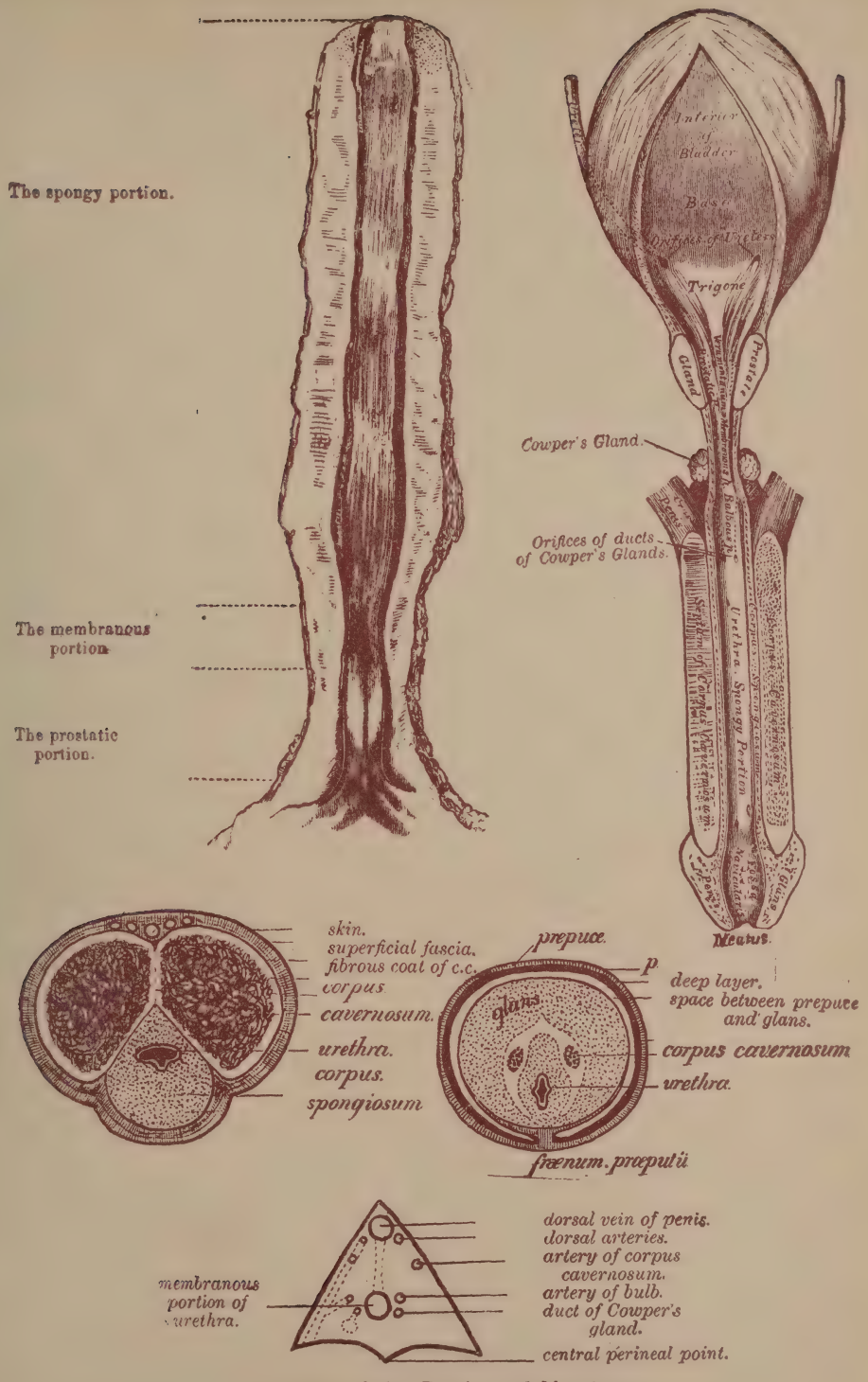
Tumors of the Prostate.

Exceedingly rare, include cysts, destructive adenoma, and carcinoma.

Cysts of the prostate are found in the neighborhood of the utriculus, and are the result of blocking of remnants of the Ducts of Mueller.

Carcinoma and *destructive adenoma* are occasionally seen in the young as well as the old. They form irregular soft tumors, which growing towards the bladder or urethra, finally involve the neighboring tissues.

Symptoms.—Similar to prostatic hypertrophy, except more rapid in onset. Hæmaturia either preceding or following urina-



Anatomy of the Penis and Urethra.

Gross and minute anatomy of penis and seminal vesicles.

tion. Malignant diseases of the prostate is usually followed by wide-spread metastices.

Diagnosis.—The presence of a tumor by rectal palpation, the age of the patient, hæmaturia, and the rapidity of growth, indicate malignant disease.

Treatment.—Symptomatic. Retention of urine should be relieved by proper catheterization, the cystitis by drainage. The prostate has been removed in an extensive case of malignant disease, the patient recovering.

The Penis.

Anatomy.—The organ of copulation and urination, chiefly composed of erectile tissue, contains three-fourths of the urethra.

The corpora cavernosa constitute the bulk of the organ; they are placed side by side and form the dorsum and sides of the penis. The corpus spongiosum is slender in comparison with the cavernous bodies, and is lodged in the groove which extends along the lower aspect of these bodies.

At the symphisis pubis the cavernous bodies diverge, and receive the name of the crura of the penis. Each crus is fixed firmly to the corresponding side of the pubic arch.

The spongy body is continued backward in the median line to near the anus, and expands to form the bulb. The bulb rests upon the anterior layer of the triangular ligament, and is firmly bound by Colle's fascia. The anterior extremity of the spongy body ends in an expanded cone-shaped mass, the glans penis. The urethra opens at the extremity of the glans by a vertical fissure, called the meatus urinarius.

The integument of the penis is soft and elastic, and is freely movable over the organ. At the glans the skin leaves the body of the penis, and, passing for a variable distance over the glans, is folded back upon itself so as to form the prepuce. The deep layer of the prepuce reaches the penis again behind the corona glandis, and is then reflected forwards over the glans, to become continuous with the mucous membrane of the urethra. Extending from the lower angle of the urinary orifice to the prepuce is a fold of integument, the frænum preputii.

In the groove on the dorsum between cavernous bodies are found the dorsal vein, two dorsal arteries, and two dorsal nerves.

Phimosis.

The inability to retract the prepuce behind the glans penis.

Varieties.—(1) Congenital. (2) Acquired.

Congenital.—The prepuce begins to develop about the third month of fœtal life. As it grows forward, an adhesion takes place between the glans penis and inner surface of the prepuce. During the first year of life, the prepuce generally becomes loosened; should this not occur, phimosis results. The majority of cases are, therefore, congenital in origin.

Acquired.—May be inflammatory or cicatricial. Inflammatory, from repeated attacks of balano-posthitis; inflammatory swelling complicating various forms of ulceration about the glans and prepuce. *Cicatricial* contraction following ulcerations; injuries, and bad circumcisions (the mucous membrane being left too long, thus permitting the scar to slip in front of the glans).

Symptoms.—Phimosis in children is associated with symptoms resembling calculus, pain on urination, frequency of micturition, urine passed with difficulty, and generally in a fine stream. There are frequent attacks of balano-posthitis with inflammatory swelling of the prepuce, and an increase of the symptoms. Retention of urine may be complete, and if not relieved, atony of the bladder frequently results. Almost all these children suffer from enuresis-nocturna. (See *Figure 19.*)

After puberty, when phimosis exists, functional sexual troubles begin; erections occasion intense pain; coitus is painful or impossible, and may result in impotence if unrelieved (pain).

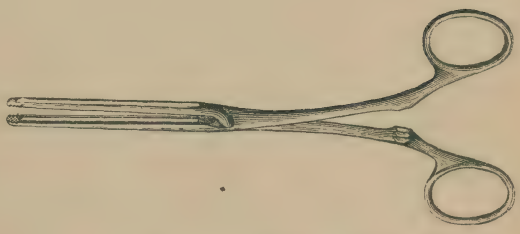
Treatment.—In the majority of instances congenital phimosis is spontaneously relieved. If the epithelial separation is not complete at birth, it may be quickly done by the flat end of a probe, the raw surface being covered with carbolated oxide of zinc ointment to prevent adhesions.

For phimosis following ulcerations, subpreputial injections of castile soap and hot water with a flat-nozzled syringe, followed by the use of lead water and laudanum solution with the addition of a half a drachm of carbolic acid to every six ounces;

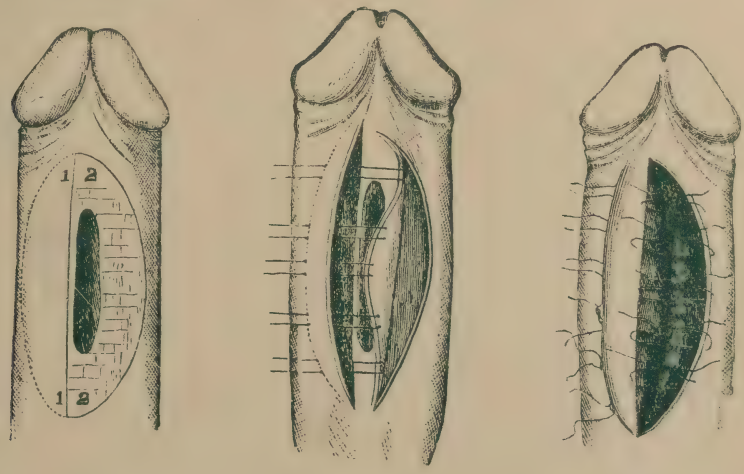
Paraphimosis, the seat of constricting being at the second groove.

Transverse section through penis. 1, cavernous body; 2, spongy body; 3, dorsal vein, 4, 4, dorsal arteries; 5, 5, dorsal nerves.

Phimosis, the constricting praeputial orifice seen.



Ricord's Phimosis Forceps.



Szymanowski's Operation for Urethral Fistula.

after which the entire organ should be surrounded by lint wet with lead water and laudanum. The subpraeputial irrigations should be repeated twice or three times daily. When this treatment fails, or in cases where it cannot be used, circumcision is required.

Circumcision.

An operation for the removal of the prepuce.

Indications.—(1) Balano-posthitis with adhesions; (2) certain cases of paraphimosis; (3) to prevent masturbation; (4) when the sexual orgasm is too early induced; (5) to prevent gangrene of the glans consecutive to concealed ulceration; (6) tuberculosis, and (7) epithelioma.

Operation.—Thoroughly cleanse, and observe the usual antiseptic precautions. Ricord's phimosis forceps are placed just behind the glans, keeping the instrument parallel with the corona, draw the prepuce in front of the glans. (See *Figure 17.*) With a sharp-pointed, straight bistoury, the prepuce is divided with a sawing motion through the fenestra of the forceps. The glans penis is still covered by mucous membrane, which should be slit up on the dorsum and trimmed with scissors to the edge of the corona, leaving just sufficient to hold a stitch; this will prevent the scar from slipping in front of the corona. It is usually necessary to ligate the frænal artery with fine catgut, and then close the wound with fine black silk sutures. The first suture is to be introduced at the frænum, the second in the median line on the dorsum, and finally at intervening points on either side, being careful to see that the raw surfaces are accurately approximated. The wound should be dressed with a gauze bandage wet with a 25 per cent. boro-glyceride solution.

In adults circumcision may be performed without the aid of forceps. A grooved director is introduced between the prepuce and the glans penis exactly in the median line of the dorsum, and on it, both layers of the prepuce are divided at one time to the edge of the corona. An assistant, with dissecting forceps, makes slight traction on the triangular flaps remaining, and with curved scissors, the surgeon cuts both skin and mucous membrane in a line parallel with the corona. The remaining wound is treated in a manner similar to the forceps operation.

Paraphimosis.

The condition in which the prepuce cannot be drawn forwards from behind the corona.

Causes.—Gonorrhœal balano-posthitis; chancrous and chancroidal ulcerations; violent coitus, and may follow retraction of tight prepuce, œdema preventing reduction.

Symptoms.—The glans penis is swollen, red and tense; over and behind the coronary sulcus is a brawny swelling, which represents the mucous surface of the prepuce. Behind this, another deep groove is seen, which corresponds to the preputial orifice, the seat of constriction.

If left unreduced, gangrene often results; or it may remain chronic, the retracted tissue becoming inelastic and indurated.

Treatment.—Render the organ bloodless by gentle manual pressure, or by a small finger bandage. Grease well with sweet oil, cross the index and middle fingers of each hand behind the glans penis, and with the thumbs, attempt to force the glans through the swollen tissue. When the condition is reduced it comes forward with a characteristic snap.

Failing in this, the preputial orifice is to be divided in the second groove with a sharp-pointed curved bistoury, cutting outward.

Lead water and laudanum is to be applied for two or three days to reduce the inflammatory swelling.

Balano-Posthitis.

An inflammation of the mucous membrane of the glans penis and prepuce. The term posthitis is used to designate inflammation of the prepuce, and balanitis that of the glans; the two surfaces are usually attacked simultaneously.

Varieties.—(1) Catarrhal. (2) Croupous. (3) Diphtheritic. (4) Diabetic.

Causes.—Chancres, chancroids, vegetations, herpes, lack of cleanliness, contact with leucorrhœal discharges, gonorrhœa, foreign bodies, diabetes, certain of the exanthemata (diphtheria, typhoid fever, measles and scarletina).

Symptoms.—*Catarrhal form.*—Itching, burning pain at the end of the penis; redness and slight swelling of the mucous

membrane; a purulent discharge about the thickness of cream, and extremely offensive. As a result of irritation from this decomposed secretion small erosions result, which, increasing in size and depth, form true ulcers; then the prepuce becomes greatly œdematous, phimosis results, and the lymphatic glands of the groin may become enlarged.

The *croupous variety* is seldom seen. It is characterized by the formation of a white membraneous exudate, which either completely or partially covers the surface of the glans. Pain is usually slight, but redness and swelling are marked.

The *diphtheritic variety* is frequently associated with diphtheria, scarlet fever, measles, smallpox, typhus and other infectious diseases.

It is characterized by the formation of a whitish-yellow deposit on the foreskin and glans, much resembling the false membrane of diphtheria. It can only be removed with difficulty, and not without some loss of substance of the tissues beneath. The prepuce is usually enormously swollen, the inguinal glands enlarged and painful, and there are frequently some constitutional manifestations, high fever, etc..

The *diabetic variety* is extremely rare. In the early stages, the symptoms are those of ordinary balano-posthitis. These are soon followed by a profuse purulent secretion, and the mucous membrane is covered with a croupous deposit derived from the decomposing smegma.

In a short time numerous minute ulcers appear, which have been variously described as erosions, vesicles, and small spots of gangrene, and belong to the same category as the furunculosis of diabetes. The ulcers are first, round, smooth, and covered with a white deposit. They soon increase in size and become irregular in outline.

In the preputial secretion, fungi are found in great numbers, and belong to the Aspergyllus.

The phimosis which complicates this variety of balano-posthitis, is at first inflammatory, and finally cicatricial (healing of the ulcers).

Treatment.—The treatment consists in removing the cause

as far as possible. Whenever the prepuce can be retracted, the parts are to be washed freely with castile soap and warm water, carefully dried, and some simple dusting powder applied:

℞. Bismuth. subnit.
Acid. boracic.
Amyl . . āā ʒi

Interpose a piece of gauze or antiseptic lint between the two raw surfaces.

If these measures fail, mild sedative and astringent washes may be tried:—

℞. Zinci. sulph. . . . grs. iv
Plumb. acet. . . . grs. vii
Morph. sulph. . . . grs. vi
Aq. rosae . . . . fʒii

A solution of nitrate of silver (20 grains to the ounce) painted over the inflamed surface will often bring about a cure.

When complicated by phimosis, subpreputial injections of castile soap and hot water are to be freely used until all retained discharge is removed, and then the following applied:

℞. Acid carbolic . . . ɬʒss
Ext. opii aq. . . grs. xviii
Liq. plumbi subacet. dil. . fʒvi

and the entire organ surrounded with lead water and laudanum solution.

In bad cases circumcision may be necessary, especially where the disease shows a tendency to become chronic.

Herpes Progenitalis.

A condition similar to herpes zoster.

Causes.—*Predisposing.*—Catarrhal diathesis, neuritis, gout, rheumatism and phimosis.

Exciting causes.—Any irritation about the prepuce or glans penis.

Symptoms.—They usually appear as one or more clusters of small vesicles, which first contain clear water, then become cloudy, finally scab over and dry up, leaving a bright red spot.

Occasionally the epithelial covering of the vesicles becomes mascerated, leaving round or irregular erosions or ulcers.

Sometimes the lesions are accompanied by slight burning, itching pain, while at other times the pain is intense. There may be a mild intercurrent balano-posthitis.

Diagnosis.—Herpes is to be distinguished from chancre, chancroid, and from the ulceration of balano-posthitis.

Prognosis.—While the disease usually disappears spontaneously in a few days, relapses are common, and some cases obstinately resist treatment.

Treatment.—The most important feature of the treatment is cleanliness. The parts should be washed daily with castile soap and hot water, thoroughly dried, and then each vesicle touched with nitrate of silver (grs. xv. to the f℥i.), and the following powder applied:

℞. Bismuth. subnit.
Acid boracic
Acetanilid . . . āā ℥i.

Constitutional treatment should correct any existing dyscrasia. In recurrent cases circumcision is necessary.

Venereal Warts.

Papillary excrescences found on the surface of the glans, and on the under surface of the foreskin.

Causes.—Uncleanliness, the irritation from decomposing smegma, causing an overgrowth of the papillary layer. They are in no sense venereal in origin.

Symptoms.—They usually commence as a group or groups of acuminated elevations, which grow rapidly, sometimes forming large masses resembling cauliflower. They may be sesile or pedunculated, and bleed freely when injured.

Treatment.—When small and single, they may be destroyed by the application of either pure carbolic or chromic acids. When large, the penis should be covered with olive oil, the warts rapidly cut away with scissors, going well down into healthy tissue, and the raw suface cauterized with pure carbolic acid. The penis should be dressed with a 25 per cent. boro-glyceride solution.

Erysipelas of the Penis.

Erysipelas occasionally attacks the penis as a result of extension from the scrotum or abdomen. It is characterized by a rapid inflammatory œdema which quickly involves the entire organ, and may result in gangrene.

Treatment.—See erysipelas.

Cavernitis.

Inflammation of the cavernous bodies of the penis.

Varieties.—Acute and chronic.

Causes.—*Acute*—wounds, urethritis, and stricture. *Chronic*—gout, rheumatism, and syphilis.

Symptoms.—*Acute*—acute cavernitis may be circumscribed or diffuse. On the under side of the cavernous bodies a hard indurated swelling is noticed, tender to the touch, and painful on urination. In a few days the nodule softens and an abscess results.

The diffuse form is frequently followed by gangrene.

Chronic.—Slow growing, painless areas of induration called Nodi's ganglia, thought by Pitha to be old hæmatomata that have not undergone absorption. The erect penis is bent at the seat of the induration, and often erections are incomplete in that part of the cavernous body lying to the distal side of the lesion.

Treatment.—*Acute*—multiple and free incision with strict antiseptic after treatment.

Chronic—mercurial ointment, ichthyol, combined with the internal administration of iodide of potash. Sometimes moderate pressure with a fine rubber bandage will cause absorption.

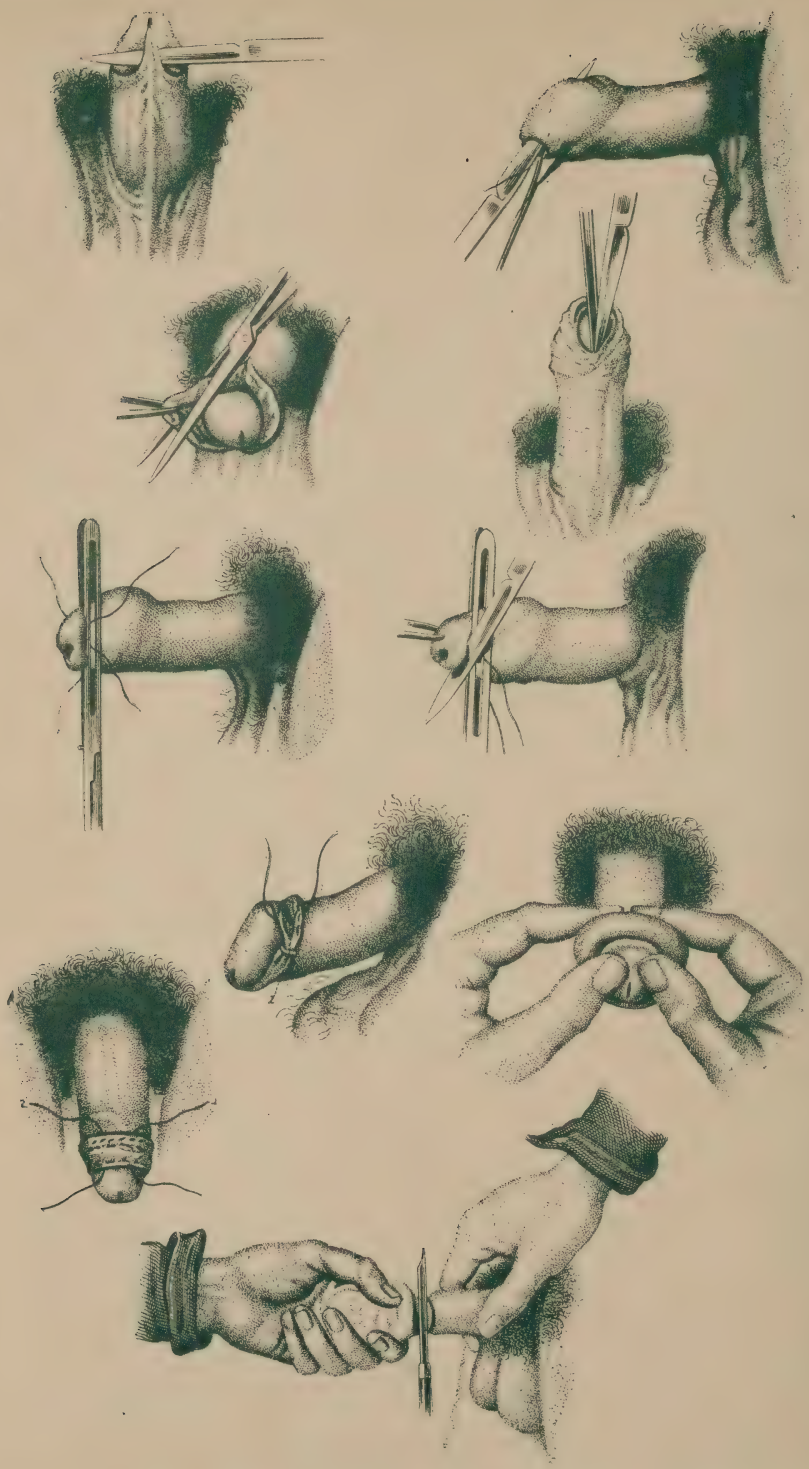
Tuberculosis of the Penis.

Tuberculosis of the penis is extremely rare.

Varieties.—(1) Balano-preputial. (2) Tuberculosis of the mucous membrane. (3) Peri-urethral.

Symptoms.—The disease is characterized by the formation of ragged, irregular, indurated ulcers, of slow growth and exhibiting little or no tendency to heal. The inguinal glands are often involved and occasionally undergo caseous changes.

Treatment.—In early stage, curette, touch with pure carbolic acid, and dress with powdered iodoform and antiseptic gauze.



Division of preternaturally short fraenum, circumcision, reduction of a paraphimotic prepuce, and amputation of penis.

Internally cod liver oil and iodide of iron should be administered. In later stages amputation of the penis may be necessary.

Priapism.

A state of chronic erection of the penis.

Causes.—Spinal injuries, vesical calculus, phimosis, and urethral inflammations.

Treatment.—The local use of cold and sedative applications combined with the internal use of bromides and opium.

Tumors of the Penis.

Tumors of the penis are rare.

Varieties.—(1) *Benign*—1. Papilloma. 2. Angeioma. 3. Elephantiasis. 4. Horns.

(2) *Malignant*—1. Sarcoma. 2. Scirrhus. 3. Epithelioma.

Epithelioma of the Penis.

Malignant tumors of the penis are far more common than the benign.

Varieties.—(1) Ulcerating. (2) Papillomatous.

Symptoms.—The disease usually begins as a rather insignificant ulcer, spreading slowly, finally becoming indurated, and destroying all the tissues as it progresses. In some cases there is an overgrowth of the papillary layer, and the growth assumes a cauliflower appearance. As the disease extends upwards, the cavernous bodies become infiltrated and the lymphatic glands of the groin enlarged.

Diagnosis.—The diagnosis is usually easy, except in the earliest stages of the disease. The age of the patient, the induration, the ulceration, are all indicative of malignant disease.

Prognosis.—The prognosis is bad unless the case is seen early, and the growth promptly removed. When the inguinal glands become involved, there is but slight chance of cure.

Treatment.—Amputation or extirpation of the penis according to the extent of the disease, and the removal of all diseased inguinal lymphatics.

Amputation of the Penis.

Amputation of the penis is indicated in tuberculosis and malignant disease.

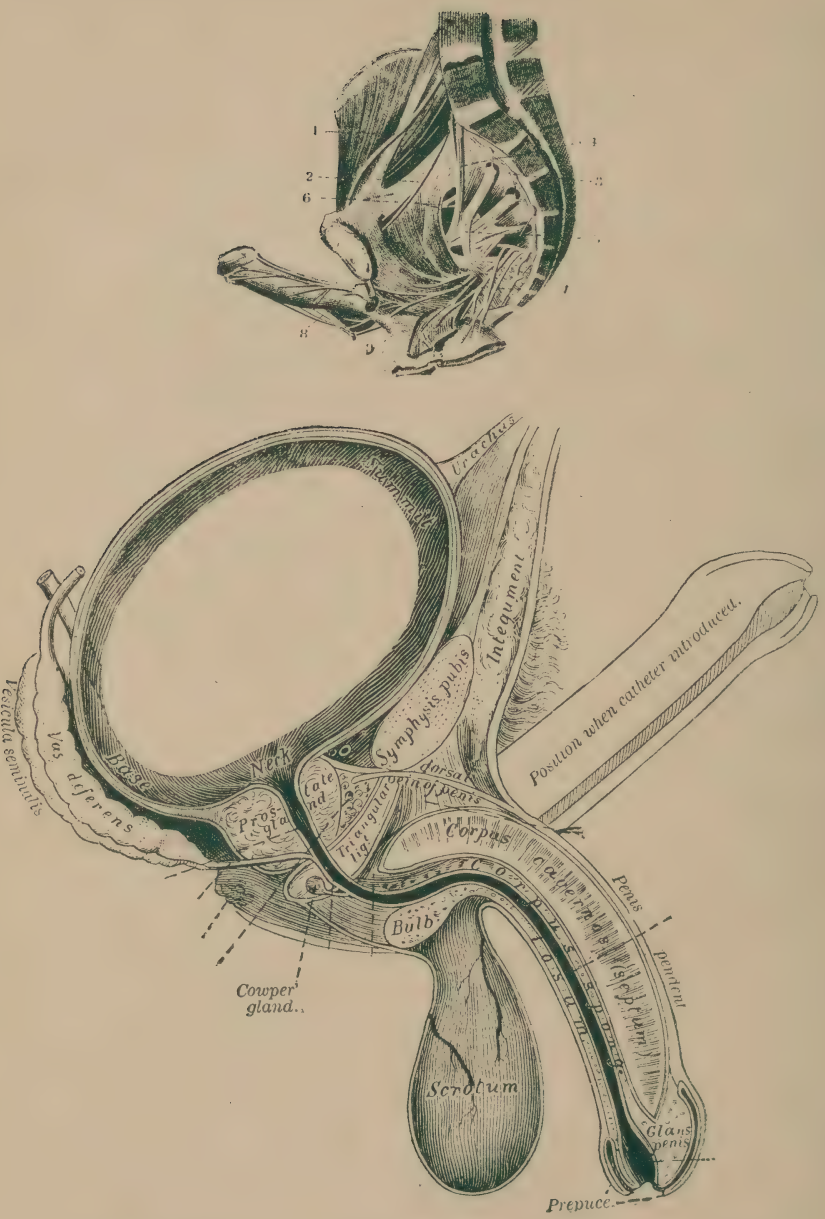
Operation.—Hemorrhage should be controlled by transfixing

the root of the penis with two long pins and surrounding the organ with an elastic bandage above the pins. Introduce a narrow bladed knife, at a point well behind the disease, between the corpus spongiosum and the cavernous bodies, and then cut forwards and downwards for about three-quarters of an inch. From this small posterior flap the urethra is dissected out. A flap of skin cut from the dorsum and the sides of the penis, being reflected backwards, the cavernous bodies are divided vertically on a level with the base of the reflected anterior flap. All vessels seen are tied with fine catgut, and the tourniquet removed. All spurting vessels are now tied. The anterior flap is punctured, the urethra drawn through the puncture, slit up and stitched in place. The two flaps are united with silkworm gut sutures. It is well to close the ends of the cavernous bodies by suturing together their sheath (tunica albuginia). A catheter should be retained in place for a week; then a small bougie passed at regular intervals, to prevent contraction of the new urethral orifice.

Extirpation of the Penis.

Extirpation of the penis is indicated in cases of malignant disease, when the organ is involved as far back as the scrotum.

Operation.—Place the patient in the lithotomy position and split the scrotum along the whole length of the raphe. The spongy body is then dissected free, and when the anterior layer of the triangular ligament is exposed, the spongy body is cut through, enough being left to bring out through the perineal incision. The crura are now carefully dissected from the pubic arch; the incision being prolonged about the penis above, the suspensory ligament is divided and the dorsal arteries secured. The divided end of the spongy body is slit up and stitched in the posterior part of the scrotal incision, and then the external wound closed. A catheter is introduced into the bladder and retained in place for from three to five days.



Lateral section of the lower genito-urinary tract, showing the normal urethral curve.

The Urethra.

Anatomy. — The urethra is a musculo-membraneous canal through which the urine, the semen, the secretions of the prostate and Cowper's glands are emitted from the body. It commences at the neck of the bladder and ends at the glans penis, and its average length is about eight or nine inches. The urethra is divided into three parts, the prostatic, membraneous and spongy.

The prostatic urethra is about one inch and a quarter in length, traverses the prostate in front of its middle lobe, and is the widest and at the same time the most dilatable part of the canal. In the middle line the mucous membrane is raised into a prominent ridge, the verumontanum, and on each side of the verumontanum a sinus exists into which the prostatic ducts open (prostatic sinus). Immediately in front of the verumontanum the sinus pocularis is situated, into which the ejaculatory ducts empty.

The membraneous urethra is the shortest and narrowest part of the canal, being about three-quarters of an inch in length. It is situated between the two layers of the triangular ligament and about an inch below the lower border of the symphisis pubis. Throughout its entire length it is enveloped by the fibres of the compressor urethræ muscle, while towards its termination Cowper's glands are placed on either side of it.

The spongy portion of the urethra is the longest division of the urethra. It is imbedded throughout in the substance of the corpus spongiosum. As it is followed forwards to the glans penis the canal presents two points of dilatation: the sinus of the bulb and the fossa navicularis.

The ducts of Cowper's glands pierce the anterior layer of the triangular ligament to empty into the sinus of the bulb.

The walls of the urethra are always in apposition, except when distended by urine, etc. At the meatus it is vertical, in the spongy urethra transverse, in the prostatic urethra triangular.

The mucous membrane of the urethra is continuous posteriorly with that of the bladder and anteriorly with the integument covering the glans penis. It is everywhere studded with the mouths of minute follicles called lacunæ. These are situated on the floor of the urethra. In the neighborhood of the fossa navicularis and on its roof there is a follicle of large size called the lacuna magna.

Hypospadias.

A congenital deficiency in the floor of the urethra.

Varieties. — In the order of frequency: (1) the balanic, (2) the penile, and (3) the perineal.

Hypospadias is usually associated with a preternaturally short corpus spongiosum, in consequence of which the organ is curved in a downward direction.

When the deformity is of the perineal variety the patient is sterile, but not impotent.

Treatment.—The defect is to be remedied by some form of plastic operation, the method of Thiersch being the most successful. As is the case with defects in other portions of the genito-urinary tract, failures are common and often eight or ten operations are necessary.

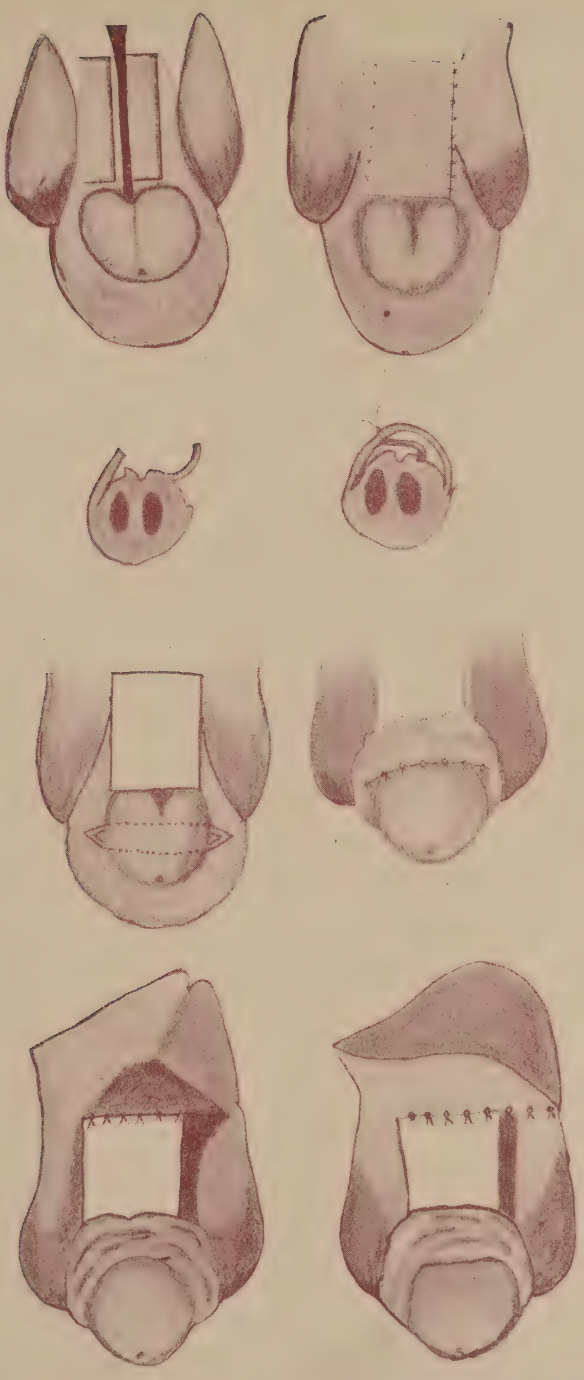
Thiersch's operation is to be performed in three stages. (See plate.)

First Stage.—The first operation consists in straightening the penis, by making a transverse incision through Buck's fascia as deep as necessary, which is to be brought together by sutures in a longitudinal direction.

The balanic portion of the urethra may be restored at the same time by freshening the edges of the cleft and bringing the raw surfaces together over a soft catheter.

Second Stage.—Two months later the penile urethra is to be restored. Two flaps are employed, rectangular in shape, the widest flap having its base away from the groove, while the base of the narrow flap is towards the groove. A soft catheter is to be introduced into the bladder, the narrow flap is turned over so that its skin surface is in contact with the catheter, and its edges are sutured into the base of the large flap. The large flap is now pulled over the raw surface of the narrow flap and its edge is sutured into the edge of the defect left by the dissection of the narrow flap. (See plate.)

Third Stage.—Two months later the continuity of the canal is completed by closing the fistulous openings left at the second operation (base of glans and peno-scrotal junction).



Thiersch's operation for Epispadias and Hypospadias.

Epispadias.

A congenital deficiency in the roof of the urethra. It is often associated with exstrophy of the bladder.

Varieties.—In the order of frequency—(1) penile and (2) balanic.

Treatment.—The plastic operation of Thiersch carried out in the same way as for hypospadias. (See plate.)

Rupture of the Urethra.

May be (*a*) Partial. (*b*) Complete.

Varieties. — (1) Spongy (bulb). (2) Membraneous. (3) Prostatic.

Causes.—Fracture of the penis, fractures or dislocations of the symphisis pubis, and contusions of the perineum.

Symptoms. — Those common to all ruptures — great pain, escape of blood from the urethra, dribbling urination or complete retention, and extravasations of urine depending upon the anatomical situation of the rupture.

Diagnostic Symptoms.—(1) *Spongy Urethra* (bulb).—In ruptures of the bulbous urethra the urine finds its way into the scrotum, penis and abdominal walls. Colle's fascia being attached at its base and on the sides to the triangular ligament and rami of the pubes, the extravasated urine first fills up this compartment. Colle's fascia being continuous with the dartos, the urine is guided upwards into the scrotum, then through the scroto-abdominal passage way to below the deep layer of the superficial fascia of the abdomen.

(2) *Membraneous Urethra.*—The extravasated urine finds its way between the two layers of the triangular ligament, and must remain there until ulceration takes place.

(3) *Prostatic urethra.*—The extravasated urine finds its way into the recto-vesical space, and then burrows along the rectum to appear at the sides of the anus.

Treatment.—If the rupture be partial, a soft instrument can usually be passed into the bladder, and retained in place for a few days. All extravasated areas should be opened up and the resulting wound treated in a thoroughly antiseptic manner. The bladder should be irrigated twice daily with 1 : 5000 nitrate of

silver solution, and at the same time, the solution should be allowed to flow between the urethra and the retained catheter in order that as near complete antisepsis as possible, may be maintained.

In cases of retention of urine, the patient should be placed in the lithotomy position and a staff or metal catheter passed down to the rupture as a guide. Make an incision in the median line of the perineum and hunt for the end of the staff, this will indicate the distal extremity of the divided urethra. The proximal end is now to be searched for. If it cannot be found within a few minutes' exploration, suprapubic pressure should be made over the bladder at the same time watching for the escape of urine in the perineal incision. Failing to find the proximal end in the perineal incision, a suprapubic cystotomy should be done and a catheter passed from the bladder out.

So soon as the proximal end has been located, a Nelaton catheter is to be passed from the meatus to the bladder, the ragged edges of the torn urethra removed, and the two ends are approximated around the catheter with fine catgut sutures. The catheter should be allowed to remain in place for at least a week or ten days. In the meantime the bladder is to be irrigated twice daily with 1 : 5,000 nitrate of silver solution, as well as the urethra itself. At the end of a week a full-sized steel sound should be passed, and afterwards at intervals of every four or five days.

As the stricture which results from rupture of the urethra is a traumatic one, a sound should be used for life at intervals of six weeks or two months.

Meatotomy

The operation for enlarging the meatus.

Indications.—(1) Explorations for strictures, (2) removal of foreign bodies and calculi, and (3) congenital strictures.

Operation.—A few drops of a 4 per cent. solution of cocaine being applied, the meatus is divided on the floor of the urethra with a blunt-pointed curved tenotome. The meatus is then packed with gauze, to be removed every time the patient urinates and to be re-inserted after each urination. At the end of forty-eight hours the meatus should be kept patulous by the regular passage of meatus bougies.

Foreign Bodies in the Urethra.

Foreign bodies may enter the urethra either from within outwards or from without inward. These include calculi, pieces of catheter, and a variety of objects inserted by sexual perverts.

Symptoms.—A sense of smarting, tearing pain in the urethra, more or less complete obstruction to the stream of urine, and the rapid onset of an acute inflammation.

Diagnosis.—A diagnosis can usually be made either by palpation, sounding, or by use of the endoscopic tube.

Treatment.—If the case is seen before any inflammatory symptoms develop, the patient should be directed to urinate forcibly by first pinching the meatus so as to balloon the urethra in front of the body. Failing in this, an attempt should be made to remove it with forceps, either with or without an endoscopic tube. If the surgeon is still unable to effect its removal, the patient should be placed in the lithotomy position and the urethra opened in the median line. After the body has been removed the wound in the urethra should be closed by fine catgut sutures, and the skin with either silk or silkworm gut.

Gonorrhœa.

An acute infectious muco-purulent inflammation, attacking chiefly the mucous membrane of the urethra male and female (also rectum and conjunctiva). It is the most frequent venereal disease with which the physician has to deal. "With it he usually begins his early practice, and until the end it causes him many anxious hours" (Finger).

Causes.—In the vast majority of cases gonorrhœa is acquired by direct infection in coitus, and depends upon a specific micro-organism called the Gonococcus. In this connection it must not be forgotten that an acute inflammation of the urethra may develop as a result of infection with other organisms. The gonococcus is a large micrococcus measuring 1.6 micromillimeters in length and 0.6 micromillimeters in breadth. They are usually found in pairs resembling the two seeds of the coffee bean. In its growth, each half of the organism divides at right angles to the median fissure. As a result of this mode of multiplication the gonococci are always found in heaps as in the case with

staphylocicci. These groups of gonococci are usually found within the protoplasm of the pus cells, although in the early stages of the disease a few organisms may be found floating between the cells. The gonococci are found within the pus cells not from any penetrating power of their own but as a result of the phagocytic activity of the leucocyte.

The number of gonococci depend upon the virulency of the infection; the greater the number the more violent the inflammation.

Methods of Staining.—Gonococci are readily stained by the aniline dyes, but they also lose their stain in comparison with the majority of other cocci. For general purposes an aqueous solution of methyl blue or a solution of carbo-fuchsine are all that is necessary. The technique is as follows: Thoroughly wash the glans penis and meatus first with alcohol and then with a solution of bichoride of mercury in order to avoid contamination with other organisms. Gently milk the urethra and spread a thin layer of the discharge over a clean coverglass, allow to dry, and then fix by passing three times through a flame. Pour a few drops of the stain upon the film and gently heat until the stain begins to vaporize; then thoroughly wash in water, dry, and mount in balsam.

Gonococci are decolorized by treatment with alcohol after the method of Gram-Roux. This negative fact constitutes, therefore, an element of diagnosis, as this method does not affect the staining of most other cocci.

Varieties.—(1) Acute inflammatory gonorrhœa (first attack).

(2) Subacute or catarrhal gonorrhœa (more than one attack),

(3) Irritative or abortive gonorrhœa (simple urethritis).

Acute Inflammatory Gonorrhœa.

Period of Incubation.—There is always a period between the time of exposure and that of the appearance of the discharge which is termed the period of incubation. This varies according to the number of organisms, their virulence, and the

tissue resistance of the individual. The following table of Lanz illustrates the varying lengths of the period of incubation:

In	2	cases	the	period	of	incubation	was one day.
"	15	"	"	"	"	"	" three days.
"	4	"	"	"	"	"	" four days.
"	9	"	"	"	"	"	" five days.
"	4	"	"	"	"	"	" seven days.
"	1	"	"	"	"	"	" eight days.
"	1	"	"	"	"	"	" ten days.
"	1	"	"	"	"	"	" fourteen days.
"	2	"	"	"	"	"	" twenty days.

The vast majority of cases develop between the third and the fifth day, and a period of incubation longer than fourteen days is extremely rare. It is usually shortest after the first infection, and becomes longer with subsequent infections.

Symptoms.—The symptoms of the acute inflammatory variety of gonorrhœa attacking the anterior urethra may be considered in three stages: (1) The increasing, (2) the stadium, and (3) the decline.

Prodromal Symptoms.—The earliest symptom of a beginning gonorrhœa is a slight tickling or pricking sensation about the meatus. During this stage patients will constantly examine the penis, even though the parts seem perfectly normal, the result of a premonition of that which is to come.

Increasing Stage.—Within twenty-four or thirty-six hours the inflammatory symptoms become pronounced.

(1) The lips of the meatus are reddened, swollen, tender, everted, and often eroded. The course of the entire urethra in the pendulous portion is swollen, tender, and sharp, shooting pains occur spontaneously.

(2) The discharge at first scanty appearing as a viscid, slightly grayish fluid, becomes converted into first a milky and then a creamy pus. At the end of the first week, thick greenish pus appears often streaked with blood. The amount of discharge varies with the virulence of the inflammation, increasing until the second or stage of stadium is reached.

(3) Ardor Urinæ or painful urination becomes well marked

during the first week. The pain varies from a slight burning sensation to that which is most agonizing. This pain results from the contact of the salts of the urine with the inflamed folds of mucous membrane, and also mechanically, from the pressure of the stream of urine distending the engorged membrane.

(4) Chordee or painful erections. Erections are very frequent and constant in the very earliest stages of the disease simply from reflex irritation. In the later stages, the inflammation invades the periurethral tissue especially of the spongy body, filling up the erectile spaces with lymph thus interfering with the blood supply, so that when the organ becomes erect, the cavernous bodies can expand while the spongy body does so in a very imperfect manner, causing the penis to curve or bow in the downward direction. If the cavernous bodies become affected, the penis may have an upward curve or to the right or left when one cavernous body is involved.

Painful erections occur most frequently at night and may be so persistent as to destroy the patient's rest. Irritation of the lumbar centre from sleeping on the back, and the reflex irritation occasioned by the urine in contact with an irritated and congested vesical neck are, in a measure, responsible for this symptom.

General symptoms are seldom or ever present, because even in the most severe varieties of the disease, the inflammatory condition is essentially a local one. In sensitive indviduals there may be slight fever, depression, malaise and anorexia.

If untreated, this stage usually lasts from ten days to two weeks.

Complications of the Increasing Stage.—(1) Balanitis, (2) posthitis, (3) phimosis, and (4) paraphimosis.

Stage of Stadium.—During this stage the discharge becomes very profuse, thick and of a greenish tinge, the ardor urinæ is marked, and the chordee severe. At this time the inflammatory process has usually extended to the bulb of the urethra, and a feeling of warmth and fullness of the perineum with pain on pressure are added to the other symptoms.

The duration of this stage is about ten days or two weeks.

Complications of the Second Stage.—(1) Folliculitis, (2) periurethral abscess, (3) lymphangitis, (4) bubo, (5) cavernitis, and (6) cowperitis.

Stage of Decline.—About the end of the fourth or fifth week there is usually a marked change in the symptoms for the better. The inflammatory symptoms diminish, the secretion becomes thinner, then milky, and finally, colorless like glycerine, the disease running its course in from six to eight weeks.

Subacute or Catarrhal Gonorrhœa.

As one attack of gonorrhœa predisposes the patient to another, repeated infections are far from uncommon. As a result of repeated attacks of inflammation, the anatomical character of the mucous membrane becomes changed, so that succeeding infections assume a subacute or catarrhal course from the start.

In this variety of gonorrhœa the period of incubation, while shorter in the earlier infections, may increase with progressive infections. Although the discharge may be a profuse muco-purulent one, the subjective symptoms are not marked or may be entirely wanting.

The inflammation is usually very superficial, either because the virus is weak, or that the mucous membrane, the result of previous inflammations, becomes changed, and is not suitable for the growth of the gonococcus.

Complications.—(1) Gonorrhœal rheumatism (arthritis), and (2) gonorrhœal ophthalmia.

Irritative or Abortive Gonorrhœa (Simple Urethritis).

Causes.—Contact with foul discharges, leucorrhœa, traumatism, irritating conditions of the urine, passage of instruments, and the use of strong irritating injections.

Many varieties of cocci may be found in the discharge in these cases, but never the gonococcus.

Period of Incubation.—The length of the period of incubation varies a good deal with the cause. It may follow within a few hours after the passage of an instrument or the use of a strong injection, or after infection with a leucorrhœic discharge, in about forty-eight hours.

Symptoms.—The symptoms are identical with the very earliest attendant upon the development of the acute inflammatory variety of gonorrhœa—swelling, redness and itching about the meatus, slight ardor urinæ, and a thin milky discharge, which can only be demonstrated by stripping the urethra.

If untreated, in the majority of cases, the discharge disappears in the course of a week or ten days spontaneously; it may, however, prove as obstinate in its course and treatment as typical gonorrhœa.

Acute Posterior Urethritis.

In about 90 per cent. of all cases of acute inflammatory gonorrhœa, the disease invades the posterior urethra by continuity of tissue in spite of the fact, that authorities claim the tonic contractions of the compressor urethræ muscle closes the urethra at that point and acts as a barrier to deeper infection.

Symptoms.—The deep urethra usually becomes infected during the third week of an acute anterior urethritis. In the early stage of the infection, the patient often thinks that he is getting rapidly well because of the disappearance of the discharge.

(1) *Increased frequency of micturition.*—This symptom is often quite pronounced and is exceedingly distressing. Very often the patient is obliged to assume the recumbent posture with the hips elevated, otherwise, he may be compelled to urinate every few minutes. This symptom is due to the fact, that the neck of the bladder becomes involved in the inflammatory process, so that the smallest quantity of urine which collects in the basfond of the organ occasions a desire to urinate.

(2) *Tenesmus.*—Great straining, attended by severe pain, the passage of a few drops of urine, without any sense of relief, is often a prominent symptom. It is due to the spasmodic contraction of the vesical sphincter.

(3) *Hæmaturia.*—The last drops of urine are often mixed with a few drops of blood, the result of the violent contractions of the vesical sphincter. In some cases the hemorrhage may be severe and flow back into the bladder.

(4) *Sexual symptoms.*—Erections are frequent but painless;

seminal emissions are frequent, and at the moment of ejaculation are attended with a sharp stinging pain in the deep urethra.

(5) *Perineal pain.*—Patients suffering with acute posterior urethritis frequently complain of a deep perineal ache or fulness, increased on defecation and urination.

(6) *Discharge.*—The discharge is analogous to that of anterior urethritis, but never passes forward into the anterior urethra because of the tonic contraction of the compressor urethræ muscle, but flows back into the bladder, there to mingle with the contained urine.

(7) *General symptoms.*—General symptoms are more pronounced in posterior than in anterior urethritis. Temperature is usually 99° to 100°, general malaise, headache, nausea, anorexia, constipation and coated tongue.

Complications of Acute Posterior Urethritis.—(1) prostatitis; (2) vesiculitis; (3) epididymitis, and (4) urethro-cystitis. A pure gonorrhœa inflammation of the bladder is extremely rare.

Pathology of Gonorrhœa.—In the vast majority of cases, gonorrhœa is acquired by direct infection during coitus. The number of gonococci, their virulence, and the tissue resistance of the indvidual, influence the rapidity of the onset of the attack.

The organisms being deposited in or about the meatus, begin to multiply under favorable conditions, and become distributed over a considerable segment of the urethra. At this stage the discharge, which is thin and sticky, is composed of serum, desquamated epithelial cells, with here and there perhaps a pus-cell. As the discharge becomes yellow, the epitheliel cells disappear and the pus-cells predominate.

In the very earliest stages, the gonoccoci may be found floating free in the serous discharge, but later, are found in the protoplasm of the pus-cell. The microbe is found in the pus-cell, not because of any peculiar movement of its own, but because of the phagocytic activity of the leucocyte.

The appearance of pus-cells in the discharge (twenty-four or forty-eight hours) indicates that the gonococcus has penetrated into the sub-epithelial layer of tissue, passing between the epithelial cells, and as the epithelial cells are destroyed a deeper

infection may occur, the gonococcus penetrating even to the papillary layer.

In the declining stage, the discharge changes in character, the pus-cells gradually disappearing, while the number of epithelial cells increase. Such a microscopical picture indicates the beginning of the healing process.

Gonorrhœal shreds, threads, urethral filaments; also called tripper faden; are divided, according to Taylor, into four distinct varieties:

(1) The pus thread, which consists of pus-cells held together by mucus. They may exist in the form of threads or irregular masses, and are usually seen at the close of the second stage of gonorrhœa (stadium). Such threads quickly sink to the bottom of the beaker.

(2) The gelatinous threads are usually seen towards the close of an acute gonorrhœa (stage of decline), and consist of pus, epithelial cells and mucus. They are often exceedingly fine and long, and slowly float about in the urine. They are, at times, thick and quite short.

(3) The Comma thread. These are short, thick, irregular threads of a light brown color, varying from a quarter to a half an inch in length. Often they have a thick well-developed head, and then resemble a comma. They are indicative of chronicity of the inflammation, and that the urethral follicles are involved.

(4) Epithelial or scaly threads consist largely of epithelial cells and mucus. They are seen as fine particles, threads, or lumps and flakes of a grayish color. The presence of a large number of epithelial cells indicates a desquamative process, such as is the case with granular patches and erosions.

Diagnosis—There are two points to be considered in the diagnosis of a urethral discharge: (1) Is the discharge gonorrhœal? and (2) From what part of the urethra does it originate?

A microscopical examination will settle any doubt as to the specific or non-specific nature of any discharge.

The following tables of differential diagnosis will prove of great value:

	Acute Anterior Urethritis.	Acute Posterior Urethritis.	Acute Posterior Urethro-Cystitis.	Non-specific Cystitis.	Phosphaturia	Bacteriuria.
Secretion at the orifice of the urethra.	Abundant.	Less abundant and often contrasting with the intensity of turbidity of the urine.	Slight and often contrasting with intensity of turbidity of the urine.	None.	None.	None.
Test of the two beakers.	First portion cloudy. Second portion always clear.	First portion very cloudy. Second portion cloudy, or clear and cloudy alternately; opacity always less than first portion.	First portion cloudy. Second portion always cloudy, difference in the opacity of both parts not marked.	First portion cloudy. Second portion always more cloudy than the first.	Both portions equally cloudy.	Both portions equally cloudy.
Test of three beakers.	First portion cloudy. Second and third portions always clear.	First portion very cloudy. Second and third portions cloudy, or clear and cloudy alternately; cloudiness always less than that of first portion.	First portion cloudy. Second portion always cloudy. Third portion very cloudy, usually more so than the first part.	First portion cloudy. Second portion like the first. Third portion more cloudy than the first and second.	All three portions equally cloudy.	All three portions equally cloudy.
Test of two beakers after irrigation of the anterior urethra.	Two portions clear.	First portion cloudy. Second portion cloudy, or clear and cloudy alternately; Cloudiness always less than first.	First portion cloudy. Second portion more cloudy than the first portion.	First portion cloudy. Second portion more cloudy than the first portion.	Both portions cloudy.	Both portions cloudy.
Reaction of the urine.	Acid.	Acid.	Acid.	Acid or alkaline.	Acid or alkaline.	Strongly acid.
Microscopical examination.	Secretion and sediment of first portion: pus-cells containing gonococci.	Secretion and sediment of both portions: pus-cells containing gonococci.	Secretion: pus-cells containing gonococci, also abundant bladder epithelium in sediment of both portions.	Sediment of both portions: pus-cells, bladder epithelium, no gonococci, but numerous bacteria.	Crystals of calcium phosphate and carbonate.	Bacteria. Few cells.
Addition of acetic acid to the urine.	Cloudiness unchanged or increased.	Cloudiness unchanged or slightly increased.	Cloudiness unchanged or slightly increased.	Cloudiness unchanged or slightly increased.	Cloudiness disappears.	Cloudiness unchanged.
Other characteristic symptoms.		Vesical tenesmus continuous or imperative; hæmaturia with the last drops of urine.	Vesical tenesmus and hæmaturia from the prostatic urethra.	Coagula of pus in alkaline urine.	Very changeable. Usually appears only once or twice daily.	

Prognosis.—The prognosis of gonorrhœa is usually good, although it must be remembered that there is no tissue which enters into the formation of the human body that has not been attacked by this organism, and the number of fatalities directly traceable to gonorrhœa are not a few.

The prognosis as regards duration is not so good. Ricord says, "Une chaude pisse commence, Dieu le sait quand elle finira," which being translated means A clap commences, but God alone knows when it will end.

The prognosis is in a measure influenced by the conduct of the patient.

Treatment of Acute Anterior Urethritis.—There are three methods of treating acute anterior urethritis:

(1) The abortive method; (2) the hand injection method; (3) the irrigation method.

The systematic treatment of gonorrhœa may be considered under the following headings:

(1) *Hygiene, diet, etc.*—During the increasing stage of an acute urethritis, the patient should be confined to bed whenever possible, at all events, all forced movements such as running, dancing, long standing and long walking should be prohibited. Coitus is to be strictly forbidden, and all forms of sexual excitement are to be avoided.

The diet is to be carefully regulated, avoiding puddings, rice, cheese, peppers, curry, asparagus, and highly salted and acid articles. The patient should confine himself largely to a milk diet whenever possible.

Alcoholic drinks of all kinds must be interdicted, especially beer and champagne. In some cases a moderate amount of well-diluted claret may be allowed without doing any serious harm.

The drinking of large quantities of pure water is to be recommended, but soda and seltzer are to be avoided.

During the night the patient should sleep on a firm, hard mattress, and on the side rather on the back, thus in a measure avoiding the tendency to chordee. He should be lightly covered, and should urinate every time he may awaken. Before going to bed it is well to recommend that patient taking a prolonged warm bath, which in a measure, will relieve the local congestion.

The bowels should be opened daily either by the use of small doses of phosphate of soda teaspoonful one hour before breakfast or by the use of hunyadi.

The Dressing.—The dressing should be recommended that will collect the discharge, permit the free escape of the same from the urethra, and, at the same time, will be convenient to quickly change, and not be too bulky.

When the foreskin entirely covers the glans penis, it should be retracted, a small piece of cotton placed over the glans, then if the prepuce is brought forward, the cotton will be held in place.

A piece of lint about four inches square may be used, a hole being cut in the centre so as to freely admit the glans to the corona, then if the four corners are folded over the glans, the discharge will be collected, and soiling of the underwear avoided.

The patient may make use of any of the varieties of gonorrhœa bags or the toe of an old sock, the apex being filled with cotton, and the base attached to a waist band.

Under no circumstances should a condom be used for the purpose of collecting the discharge, since it really acts as a poultice.

Every time a dressing is changed the patient should be instructed to thoroughly wash the glans and meatus with soap and hot water, thus avoiding such complications as balanitis and posthitis.

The patient should be advised to wash the hands thoroughly after each time the organ is handled, and be cautioned as to the dangers and seriousness of conjunctival infection.

Internal Treatment.—When the inflammatory symptoms are very marked, and the ardor urinæ severe, the following mixture will prove of especial value:

℞. Tincturæ aconiti . . gtts. xxiv
Tincturæ belladonnæ . fʒss
Sodii bromidi
Acidi boracici . . āā ʒij
Liq. potassii citratis q. s. ad fʒvi
M. S. fʒss every four hours.

It is a good plan to supplement these remedies by those which when eliminated by the kindeys exert a germicidal effect upon the canal, such a combination as suggested by White will prove of great value in modifying the course of the disease and often preventing complications.

℞. Salol . . . . grs. v
Oleoresin. cubeb. . . grs. v
Balsam. copaibæ . . grs. v
Pepsin . . . . grs. i
From 4 to 6 to be taken daily.

In poorer patients, an emulsion of the balsams known as the Lafayette Mixture may be employed:

℞. Balsam copaibæ . . . fʒss
Liq. potassæ . . . fʒi
Ext. glycyrrhizæ fl. . . fʒss
Oleii gaultheriæ . . . ♏ x
Aquæ . . . q. s. ad. fʒiv
M. S. fʒii every four hours.

The Abortive Treatment.—The abortive treatment consists in the use of strong urethral injections, particularly nitrate of silver, to be used in the very earliest stages of the disease. The objects desired are to convert a specific or microbic inflammation into a chemical one, and at the same time, destroy the organisms which lie superficially.

It is only in the very earliest stages of the disease that this method of treatment is applicable, that is, when the discharge, examined microscopically, is found to contain gonoccoci and desquamated epithelial cells. When the discharge contains pus-cells, it indicates that the micro-organisms have penetrated to the subepithelial tissue, and, therefore, any injection intended to kill the organism must, of necessity, destroy the urethra.

Method of Application.—The patient urinates, the surface of the glans penis is cleansed first with alcohol, then with bichloride of mercury solution 1:2,000. A few drops of a four per cent. solution of cocaine are now injected into the urethra, and the patient requested to compress the urethra at a point two inches behind the meatus. A blunt-pointed urethral syringe

holding half an ounce is filled with a solution of nitrate of silver twenty grains to the ounce. The nozzle of the syringe is inserted into the meatus and the piston forced home until the urethra anterior to the point of compression is thoroughly distended. This procedure is to be repeated three times in succession. After this treatment, the patient should be confined to bed for from twenty-four to thirty-six hours, and lead water and laudanum or cold compresses applied to the penis. The discharge becomes profuse within a few hours and often tinged with blood; at the end of forty-eight hours it again becomes thin and watery, to entirely disappear within a week or ten days if the treatment has been successful. In the event of failure, the acute stage develops with much greater severity.

Hand Injection Method. — During the stage of invasion, the use of curative remedies is contraindicated, because the micro-organisms are penetrating into the deeper layers of tissue, and cannot be reached by antiseptic solutions. As most patients demand an injection, one must be selected that will at least not aggravate the trouble, but exert a soothing influence upon the inflammatory condition; it should be antiseptic and sedative. The following is commonly recommended as an injection in the early stages;

℞. Acid carbolic . . . . . f℥ss
Ext. opii aq. . . . . grs. xviii
Liq. plumbi subacetatis dil. q. s. ad f℥vi

M. S. Use after each act of urination, and dilute if painful.

In making a hand injection a blunt-pointed syringe of the capacity of half an ounce should be employed. The glans penis should first be cleansed with a little soap and hot water; the syringe charged with the injecting fluid; the tip of the syringe gently inserted into the meatus; the lips of the meatus gently compressed about the syringe by the thumb and index finger of the left hand, and then the piston slowly and gently pushed home. The syringe is now removed and the meatus compressed so that the injection may be retained for at least five minutes. The injection should be repeated after each act of micturition.

In ordering an injection the patient should be recommended

to dilute the solution at least one-half with plain water, and then to add less water each time until a feeling of warmth is produced. This will always indicate the proper strength; any injection that causes distinct pain is doing harm and not good.

Whenever any injection causes pain, no matter how dilute, the use of all injections is contraindicated.

About the end of ten days or two weeks when the stage of stadium is reached, when the discharge is profuse and decidedly muco-purulent, the disease has about run its course and curative injections are indicated:

℞. Acid carbolic . . . . fʒss.
Zinci sulphocarb. . . grs. xxiv
Boroglyceride (25%) . . fʒii
Aquæ . . . q. s. ad fʒvi
M. S.—Dilute if painful.

℞. Injection Brou.
Zinci sulph. . . . grs. vi
Plumbi acet. . . grs. xv
Tr. opii
Ext. krameria fl. . . āā fʒiii
Aquæ . . . q. s. ad fʒvi
M. S.—

℞. Ext. hydrast. fl. . . . fʒii
Bismuth subcarb. . , . ʒii
Glycereni . . . . fʒii
Aquæ . . . . . fʒiv
M. S.—Use after urination.

If, at the end of a week or ten days the discharge has not entirely disappeared stronger injections should be ordered:

℞. Acid carbolic . . . . fʒss
Acid tannic . . . . ʒi
Acid boracic . . , . fʒii
Aquæ . . . . . fʒvi
M. S.—Dilute if painful.

℞. Ultzman's injection.
Zinci sulphatis
Pulv. alum . , āā grs. viii
Acid carbolic . . . grs. iii
Aquæ . . . . fʒvi
M. S.—Dilute if painful.

℞. Zinci acetat.
Acid tannic . . āā grs. xv
Aquæ . . . . fʒiii
M. S.—

When the discharge has entirely disappeared, the patient should be requested to urinate in a urine beaker, and the urine examined for shreds. All shreds that float usually consist of mucus and require no attention, when, however, they sink, it is indicative that they also contain pus-cells, and further treatment is necessary.

If the shreds are composed solely of mucus, the injections should be gradually decreased in frequency, so that all treatment is stopped at the end of a week. After the cessation of all treatment a full week should elapse before the patient relaxes the strict regimen under which he has been living. At the end of that time, the first urine passed in the morning should be centrifuged and examined for pus; if the urine is entirely free, he can safely resume his ordinary mode of life.

The ardor urinæ is to be relieved by the internal use of aconite, belladonna, and bromides (see page 103). The patient should also be instructed to immerse the penis in a glass of hot water during each act of micturition. This procedure, by equalizing the circulation, often brings about instantaneous relief from this very distressing symptom.

For the relief of chordee, the bowels should be opened daily, the patient should take a hot bath before going to bed, he should sleep on a hard mattress, the room should be cool, and the covers few. Each time the patient awakens during the night he should be recommended to get up and urinate. He should also be instructed to sleep on his side rather than on the back to avoid irritation of the lumbar centre. If these simple measures fail the following formula may be used:

℞. Pulv. opii . . . grs. v
Pulv. camphoræ . . grs. xv
Ext. belladonnæ . . grs. ii
Oleii theobrom. q. s.
M. F. Ft. Suppos. No. V. S. One at bedtime.

In some cases six or eight ounces of blood may be removed from the perineum by leeches.

Irrigation Treatment.—The treatment of gonorrhœa by the method of Janet has attracted considerable attention both in this country and in Europe. It is applicable to any stage of gonorrhœa, and by its use, there is usually a most rapid subsidence of the inflammatory symptoms.

The apparatus required is a quart fountain syringe with a tube, so attached that the level of the bag will be about eight feet above the level of the patient's bladder; and a Nelaton catheter of either 11 or 15 French in caliber.

The solutions employed in the irrigator are bichloride of mercury 1 : 25,000; potassium permanganate 1 : 5,000; and nitrate of silver 1 : 10,000. The potassium permanganate solution is the least irritating of the three, and is the one to be employed in the early stage of all acute cases.

The technique of application is as follows: The patient is requested to urinate, and the glans penis and the meatus cleansed first with alcohol and then with a solution of bichloride of mercury 1 : 2,000. The sterilized Nelaton catheter is now lubricated with the following:

℞. Acid. boracic. . . . . ʒss
Acid. carbolic. . . . . fʒss
Glycerin. . . . . fʒiii
M. S.—

and gently inserted into the urethra as far back as the bulb. The irrigating bag is now filled with one quart of permanganate solution 1 : 5,000 at a temperature of 115° or 120° (as hot as can be borne by the patient), the snap released, and the air forced out of the tube by the flow of solution. The patient now stands in front of an ordinary wash-stand, the tube of the irrigating bag is connected with the catheter, and the fluid allowed to escape between the catheter and the inflamed urethral walls. The injections are to be repeated twice daily (night and morning), and increased in strength 1 : 500 each day until the eighth day. If the irrigation has been satisfactory, an irrigation of 1 : 5,000 is given for a week and then all treatment stopped.

Within a few hours after an irrigation, the discharge is changed into a whitish serum, finally again becoming purulent

as the effects of the irrigation wear off (about eight hours); hence these irrigations should succeed each other so rapidly that the return of the purulent discharge is entirely prevented.

When the irrigation treatment is carefully carried out, usually from 11 to 15 irrigations are necessary to bring about a cure.

When nitrate of silver or bichloride solutions are used the increase in strength must be made more gradually because of their excessively irritating qualities.

When the discharge recurs after the permanganate treatment, the gonococci have not been entirely destroyed. In such cases, the usual routine must be again instituted and carried out as, above described.

If a slight muco-purulent discharge persists after the careful use of the permanganate solution, and a microscopical examination of the same fails to demonstrate the presence of gonococci, the permanganate solution should be stopped and a solution of nitrate of silver used, beginning with 1 : 10,000 and gradually increasing according to the effect produced.

The advantages of the irrigation treatment are.—(1) The discharge rapidly becomes changed in character and in quantity; (2) the ardor urianæ and chordee are less intense; (3) complications are rare, and (4) the disease usually runs a milder course and the duration of the attack is shortened.

When the irrigation treatment is followed by an increase of symptoms, it should be immediately discontinued.

During the irrigation treatment the hygienic and the internal medicinal treatment are the same as for the injection treatment.

Treatment of Acute Posterior Urethritis. — When salol does not increase the symptoms, it should be administered thrice daily in doses of five grains; its effects may often be enhanced by the addition of ten grains of boracic acid. The patient should be confined to bed when possible, or at least lounge about the house. The bowels should be opened daily, and the diet limited to milk.

The posterior urethra should be irrigated as in a manner described for anterior urethritis, the catheter being passed behind the compressor urethræ muscle, and the solution allowed to flow back into the bladder until the desire to urinate becomes urgent.

The catheter is then withdrawn and the remainder of the solution allowed to flow through the anterior urethra.

Potassium permanganate is to be used, beginning with a strength of 1 : 8,000 and gradually increased according to the effect produced as in the treatment of anterior inflammations.

If the irrigations in any way seem to aggravate the trouble they are to be immediately stopped..

The treatment of the *subacute* or *catarrhal variety* of gonorrhœa is in every way similar to the acute inflammatory, except that curative injections can be used in the very earliest stages.

The *irritative* or *abortive* variety requires the internal use of salol and the local use of a simple sedative injection:

℞. Plumbi acetatis . . grs. vii
Aquæ . . . . fʒiii
M. S. To be used after each urination.

Chronic Urethral Discharges.

Any urethral discharge persisting after three months' treatment may be considered chronic.

Varieties.—(1) Urethral catarrh or urorrhœa.
(2) Chronic gonorrhœa
(3) Gleet.

Urethral Catarrh or Urorrhœa

A catarrhal discharge dependent upon a weak and leaky mucous membrane; it is nothing more than an excess of what is otherwise a normal secretion.

Causes.—Such patients are usually very anæmic, and the general health is below par. They are predisposed to inflammations of mucous membranes.

Symptoms.—A sense of moisture about the meatus may be the only symptoms. Sometimes there escapes from the urethra, especially after stripping, a few drops of colorless sticky fluid not unlike glycerine. Such patients are often greatly worried over this, and keep up the trouble by the constant use of injections or by frequent stripping of the urethra.

Treatment.—For the relief of this harmless discharge, the general health should be improved by the use of tonics and large doses of iron:

℞. Strychniæ sulph, . . grs. i
Acid phosphoric, . .
Tr. ferri chloridi . . āā fʒii
Syrup simplex . . . fʒi
Aquæ q. s. ad. . . . fʒiii

M. S. fʒi in water, three times daily through a tube.

Such patients may be recommended to use Burgundy and claret with their meals.

Chronic Gonorrhœa.

In the latter stages of gonorrhœa the inflammatory process shows a great tendency to become localized in some part of the urethra, and there remains in a subacute state.

Causes.—Too early cessation of the regimen followed out during the height of the acute attack; sexual and alcoholic indulgence during the declining stages of the disease; improper treatment; insufficient treatment and repeated acute attacks. There are certain portions of the urethra predisposed anatomically to the development of chronic inflammations, the fossa navicularis, bulb and prostatic urethra; first, because of the abundance of follicles, the amount of peri-urethra tissue (bulb), and the great vascularity (bulb and prostate).

The anatomical investigations of Weichselbaum quoted by Finger, give the following results:

Pendulous urethra	in	15 cases
Pendulous urethra and bulb	in	1 case
Bulb alone	in	1 case
Pendulous urethra and prostatic urethra . .	in	1 case
Pendulous urethra, bulb, and prostatic urethra	in	5 cases
Membraneous urethra and prostatic urethra	in	1 case
Entire urethra	in	1 case
Prostatic urethra alone	in	6 cases
		31 cases

Pathology.—The cylindrical epithelium is converted into squamous epithelium; and the subepithelial connected tissue is the seat of a round-celled infiltration, which has a decided tendency to transformation into contracting cicatricial tissue. The infiltration may be either superficial or deep. The cicatrix does not result from ulceration, but from chronic connective tissue hyperplasia.

Symptoms.—The symptoms vary according to the seat of the trouble. The most characteristic symptom is a muco-purulent discharge which varies in quantity from that which simply glues the meatus together to several drops during the day. Usually a small drop is seen in the morning upon arising, the scantiness of the discharge and the frequency of micturition during the day prevents its accumulation in sufficient quantities to show. It is increased in quantity by fornication and indulgence in alcohol.

Diagnosis.—The diagnosis is usually easy, the urine passed in two portions, the first containing clap threads, while the last is clear.

Clap threads are constantly found in the urine and are either of the gelatinous or comma variety.

The anterior urethra should always be explored as far as the bulb with bougie a boules and any spots of tenderness or narrowing should be carefully noted.

The endescopic tube may be employed to determine accurately the position and variety of the localized lesion.

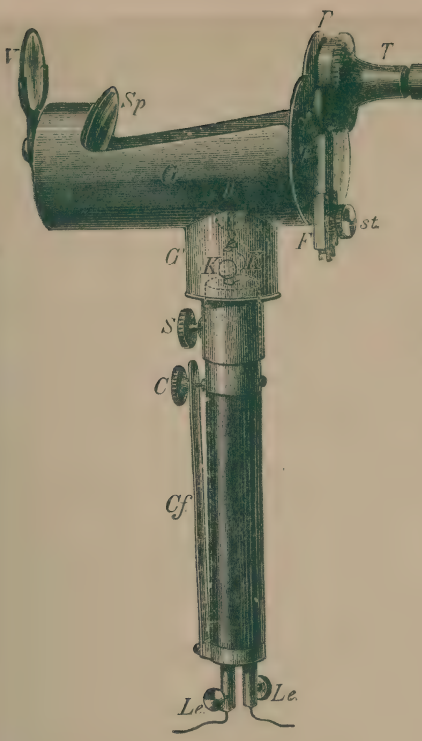
Treatment of Chronic Anterior Urethritis.—The caliber of the urethra should be restored by the frequent use of a full-sized steel sound, if the meatus will not admit an instrument of the proper size, a meatotomy should be performed. The use of the sound should be followed by the frequent use of some astringent injection, or by daily irrigations of nitrate of silver 1 : 10,000 gradually increased according to the effect produced.

When an endoscopic examination of the urethra reveals the presence of localized patches of granular urethritis, the erosions may be touched with the following solutions through the endoscopic tube:

Nitrate of silver grs. x to the f℥.; copper sulphate from a one to a five per cent. solution; pure iodine; Lugol's solution; equal parts of pure carbolic and Lugol's solution.

The more superficial the patch the more value the nitrate of silver injections are. In the beginning, weak solutions should be tried, and then gradually increased according to the effect produced.

Inflamed follicles may be exposed by the use of the urethral



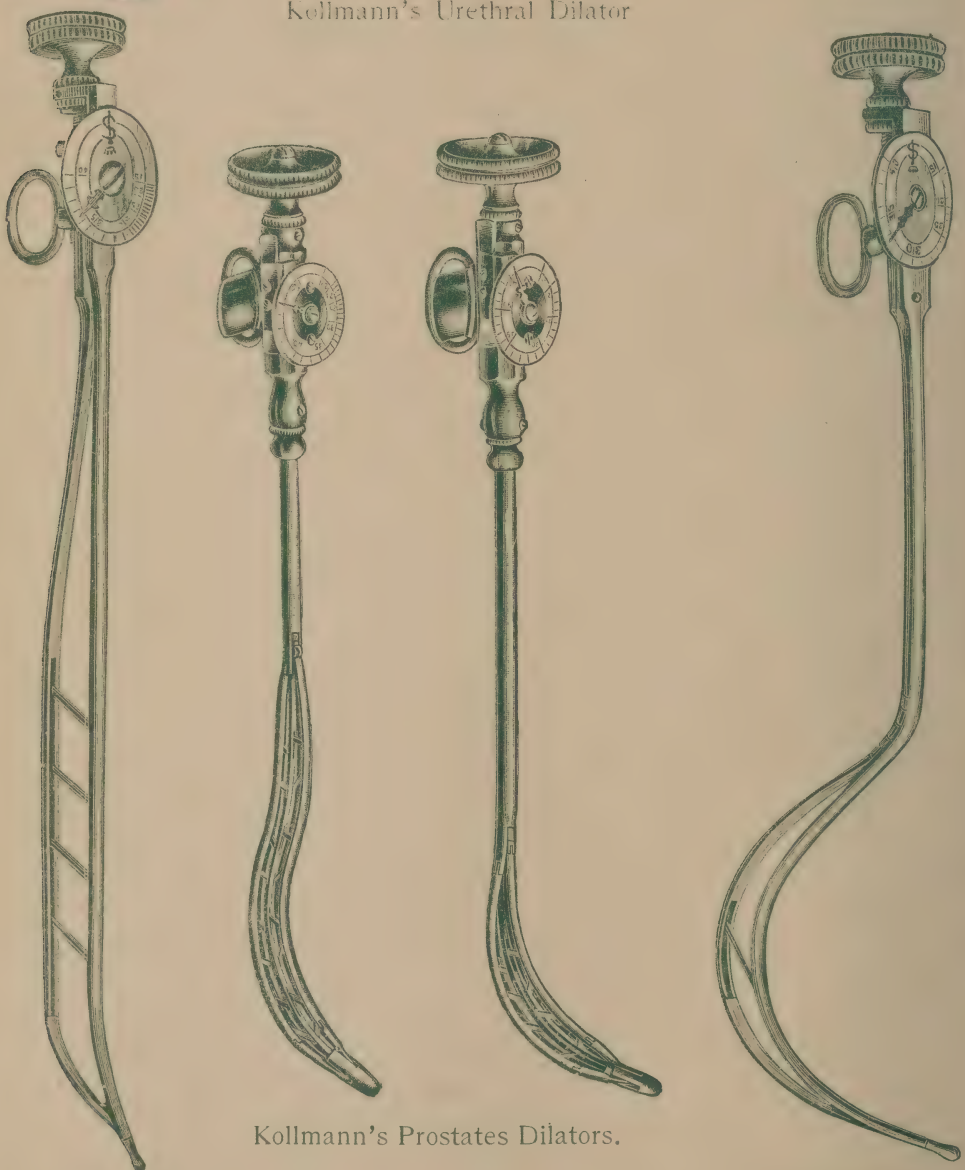
Leiter's Urethroscope

Otis's Urethroscope

Endoscopic tubes and Urethral Speculum.

Oberländer's Short Urethral Dilator.

Kollmann's Urethral Dilator



Kollmann's Prostates Dilators.

Oberländer's
Long Urethral Dilator.

Oberländer's
Prostatic Dilator.

speculum, the contents may be expressed by pressure, and then a few drops of a two per cent. solution of nitrate of silver may be injected through a fine capillary tube.

Many of these cases are benefited by the internal administration of full doses of the balsams.

Chronic Posterior Urethritis.—Like anterior urethritis, the course of chronic posterior urethritis is often a latent one.

Pathology.—The pathology is similar to that of chronic anterior. The disease runs its course in the upper layers of the subepithelial connective tissue, and is a chronic inflammatory process with a first stage of small-cell infiltration and connective tissue proliferation, and a second stage, in which fibrous tissue forms (Finger). The second stage is usually more or less superficial and is not followed by the customary cicatricial contraction.

Symptoms.—The inflammation in many cases, may be so superficial as to occasion but few and slight symptoms. When deeper seated, there may be more or less tenesmus, pain in the perineum, frequent nocturnal emissions, impotence, and the general symptoms of sexual neurasthenia.

As is the case with acute posterior urethritis, the discharge of the posterior urethra cannot flow forward beyond the compressor urethræ muscle but must flow back into the bladder and there to mix with the urine. These chronic cases may become subacute by over-indulgence in alcohol or coitus, in that case the inflammation by continuity of tissue, extends forward into the bulb, and a discharge appears at the meatus.

Diagnosis.—The diagnosis can usually be made by the two glass test. The patient is requested to urinate about half the urine contained in the bladder into one beaker and the remainder into another, when the posterior urethra is involved, the urine contained in the second glass will appear cloudy.

In mild cases of chronic posterior urethritis the discharge is so slight that it does not flow back into the bladder, in that case the first urine will contain all the shreds of the posterior urethra, and the second urine will appear clear. Under these circumstances the anterior urethra as far down as the bulb, must be

washed free of all secretion by an irrigation through a catheter with boracic acid solution, then when the patient urinates into the beaker, any shreds present will be from the posterior urethra.

The table of differential of diagnosis arranged by Finger will prove of value. See Page 115.

Treatment.—The same general hygienic and dietetic rules recommended in acute urethritis must be enforced. Internally, salol and boracic acid may be administered, or when they do not disagree with the stomach the balsams may be used in full doses.

The irrigations should be tried as recommended for the relief of acute posterior urethritis. Failing in these, instillations may be tried.

Instillations are made by means of the Ultzmann's syringe introduced as an ordinary catheter until the point reaches the compressor urethræ muscle, then if the handle is slightly depressed through an arc of ten degrees the point of the instrument will be about in the centre of the prostatic urethra. (*Figure 20.*)

For instillation purposes, from ten to twenty drops of the following solutions, depending upon the strength, may be used:

Nitrate of silver, from one-half to five per cent.; copper sulphate, from one-half to five per cent.; bichloride of mercury, 1:2,000; Lugol's solution; equal parts of Lugol's solution and carbolic acid.

The effects of an instillation may often be enhanced by the previous introduction of a full-sized steel sound.

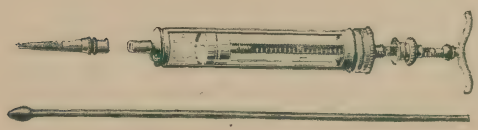
Ointments have been recommended by Finger because their effects are more lasting; fifteen to sixty grains of argent. nit. or copper sulph., or creoline thoroughly mixed with three ounces of lanolin and two drachms of olive oil, introduced into the prostatic urethra by means of a Tommasoli's ointment carrier. (*Fig. 21.*)

In inveterate cases, the prostatic urethra must be over-stretched by a prostatic dilator so as to break up the new bands of fibrous connective tissue. This treatment may be repeated every eight or ten days, and may be combined with prostatic massage through the rectum.

Gleet.

Gleet is a variety of chronic urethral discharge, which always originates from a granular patch behind a stricture. (See stricture.)

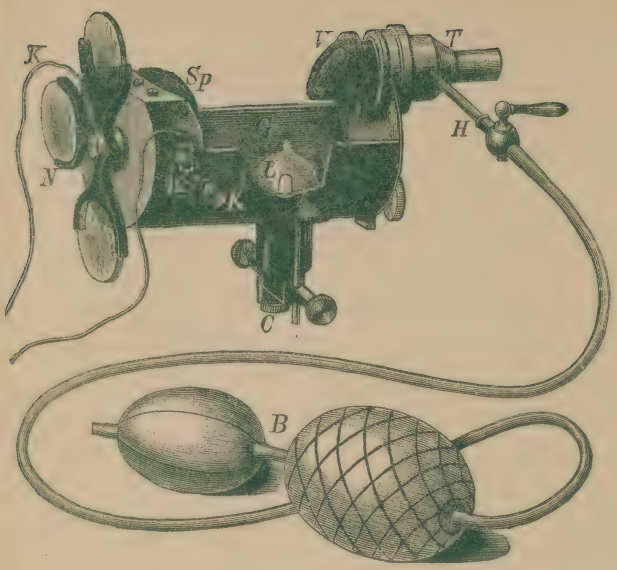
Ultzmann's Syringe for deep urethral injections.



Guyon's Syringe and hollow bougie à boule for deep urethral injections.

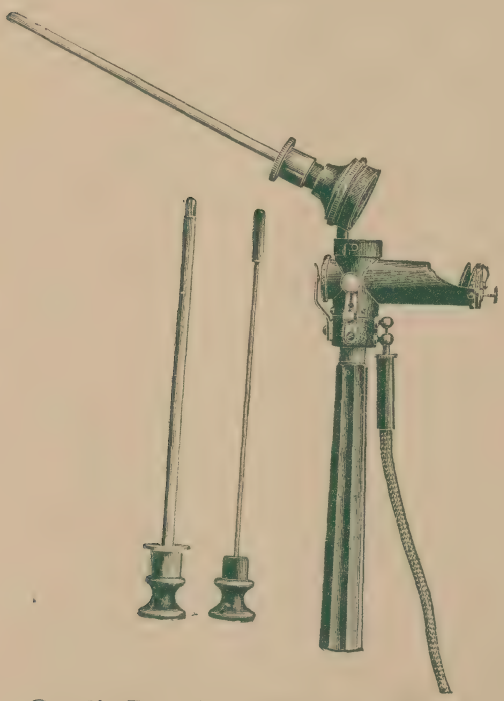
Valentine's Endoscopic tube for vesical exploration of the Urethra, with bracket for lamp.

Klotz's Endoscopic tube for urethral inspection and treatment.



Fenwick's Electro-Urethroscope for balooning the Urethra.

Oberländer's Endoscopic tube, with light at beveled end for urethral inspection.



Goerl's Electrical Endoscopic tubes for Urethral Inspection.

Antal's Endoscopic tube for exploration of the fossa varicularis.

Differential Diagnosis — **Chronic Anterior Urethritis and Chronic Posterior Urethritis.**

	Superficial Variety.	Deep Variety.	Superficial Variety.	Deep Variety.
Secretion at the orifice of the urethra.	In recent cases, muco-purulent secretion, constantly, or a morning drop. In inveterate cases, gluing of the meatus, constantly or only in the morning, or meatus perfectly dry.		No secretion at meatus.	
Test of the two beakers.	First portion slightly cloudy, or clear with clap shreds. Second portion clear, without shreds.		In recent cases: First portion slightly turbid, with clap shreds. Second portion slightly cloudy. In inveterate cases: First portion clear, with clap shreds. Second portion clear.	
Test of two beakers after irrigation of the anterior urethra.	Both portions clear.		In recent cases: First portion slightly cloudy, with clap shreds. Second portion slightly cloudy. In inveterate cases: First portion clear, with clap shreds. Second portion clear.	
Examination with the urethrometer.	No diminution of dilatability.	Diminution of dilatability in one or more circumscribed spots.		
Other characteristic symptoms.	None.	None.	Increased or imperative vesical tenesmus. Prostatorrhœa.	Increased or imperative vesical tenesmus, prostatorrhœa, pollutions and impotence.

Gonorrhœal Arthritis.

Attacks the knee, ankle, elbow, or wrist.

Causes.—Systemic infection with the gonococcus. The disease often appears about the sixth week of a catarrhal urethritis, although it may appear as early as the third week.

Symptoms.—The symptoms are those of any acute arthritis —heat, swelling, redness, pain, and loss of function. It may be preceded by a chill and is usually attended with moderate fever. Suppuration rarely takes place.

Diagnosis.—Gonorrhœal arthritis is to be distinguished from ordinary rheumatism.

Gonorrhœal Arthritis.	Rheumatism.
1. Limited to one joint.	1. Attacks several joints.
2. Remains in one joint.	2. Jumps from joint to joint.
3. Unattended with sweating.	3. Profuse sweats.
4. Fever moderate, 102.	4. High fever.
5. Presence of a urethral discharge.	5. No urethral history.
6. Salicylates of no value.	6. Usually cured by salicylates.
7. Obstinately resist treatment.	7. Usually responds quickly to treatment.

Treatment.—The course of gonorrhœal arthritis is usually a prolonged one, obstinately resisting all forms of treatment.

As soon as the condition can be diagnosed, iodide of potash and bichloride of mercury should be administered internally.

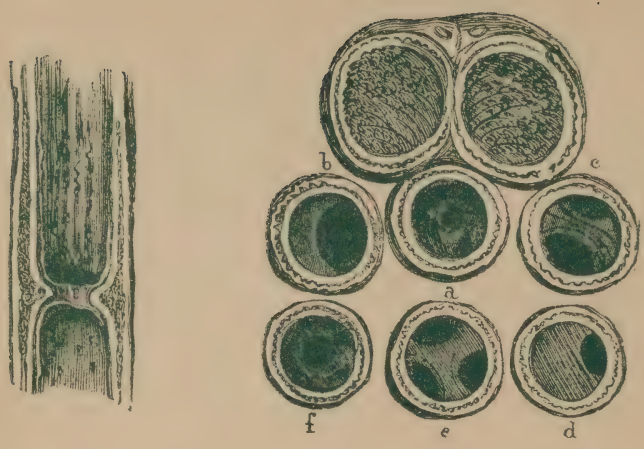
Locally absolute fixation in the early stages by splints and the daily application of superheated air constitutes the most successful plan of treatment. After the acute symptoms have subsided, inunctions (locally) of belladonna and mercurial ointment should be used and the joint gently masseyed.

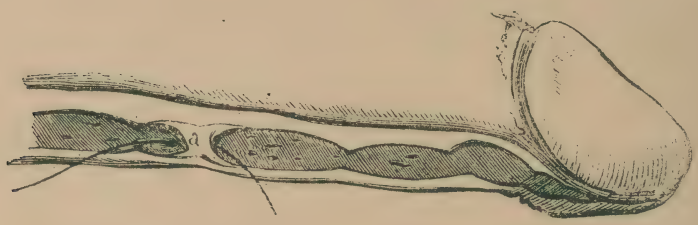
Stricture of the Urethra.

A stricture is a narrowing of the urethra, caused by changes in the tissues, or by spasm of the muscles.

Varieties.—(1) Congenital; (2) acquired.

Congenital strictures are extremely rare except in the neighborhood of the meatus. The physiological narrowing of the meatus is not in any sense a stricture, as it favors the projection of





Organic strictures of the anterior urethra, showing varieties, seat and situations of the openings.

Urinary fistulae, resulting from tight deep strictures.

the stream of urine and the vigorus ejaculation of the semen. *Acquired* are classified as (1) inflammatory; (2) spasmodic; (3) organic.

Inflammatory Stricture.

This variety of stricture may result from an inflammation attacking any narrow canal, and is a result of the inflammatory exudation. It is of but little importance, as it is seldom if ever followed by retention of urine.

Spasmodic Stricture.

A temporary stricture caused by muscular contraction, usually the compressor urethræ.

Causes.—Psychical, as in case of nervous individuals who cannot urinate in the presence of others; it may result from chronic gonorrhœa (granular patches with hyperæsthesia); or it may follow reflexly any disease of the rectum, fissure, piles, worms, etc.

Organic Stricture.

Organic stricture may be inflammatory or traumatic.

Causes.—In the vast majority of instances stricture of the urethra results from some antecedent inflammation of the canal, although it may follow chancre, chancroid, or keloid (Taylor). The longer the duration of gonorrhœa the more liable the patient is to suffer from stricture.

Traumatic strictures result from partial or complete rupture of the urethra, or from false passages.

Varieties. — *1. Large or Small Caliber.* — (1) *Large* when above a 15 French. (2) *Small* when below a 15 French.

2. Passable or Impassable. — (1) *Permeable* or passable. (2) *Impermeable* or impassable. A stricture may be permeable to urine, but impermeable to instruments.

3. Simple, Irritable and Resilient.—(1) *Simple*—Not extreme or complicated, common symptom of strictures. (2) *Irritable*—Instrumentation followed by severe pain and hemorrhage. (3) *Resilient*—Recurring in a short time after dilatation.

Seats of Stricture.—The majority of gonorrhœal strictures occur at the bulbo membraneous junction; the next most frequent point is in the fossa navicularis, and the least frequent between

the fossa navicularis and the peno scrotal junction. In other words those parts of the urethra in which gonorrhœal is most likely to become chronic. Strictures are never found in the prostatic urethra, and seldom or never in the membraneous urethra.

Number of Strictures.—The majority of cases are single. Three or four may occur in the same individual.

Time of Occurrence.—Gonorrhœal strictures are usually of slow formation, that is, they do not give rise to symptoms until many months or even years after the attack of gonorrhœa.

Pathology.—The pathology of stricture is that of chronic urethritis. As Finger has described, there is at first a proliferation and round celled infiltration of the subepithelial connective tissue, this in time, organizes and like scar tissue in other parts of the body, contraction takes place and a stricture results.

After a stricture has existed for some time, the urethra behind the stricture begins to dilate or balloon owing to the increased resistance to the flow of urine. As a result of this, a pouch is formed, the urethral walls are thinned, and a few drops of urine becomes stagnant in the pouch. Ammoniacal fermentation follows, and erosion occurs, a minute rupture results, and the urine escapes into the periurethral connective tissues forming abscesses which finally burrow and appear at some point in the urethral triangle of the perineum. With these changes, the bladder may become thickened or dilated, the ureters involved, and the patient finally dies of advanced kidney degeneration.

Symptoms.—(1) *Frequency of Micturition*—results either from the irritable condition of the bladder caused by the increased effort necessary to expel the urine from the bladder; or it may result from the development of a granular patch behind the stricture, the inflammation extending by continuity of tissue to the posterior urethra.

(2) *Diminution in the size of the stream.*—This is a late symptom, as the bladder by compensatory hypertrophy usually counteracts until late.

(3) *Loss of the parabolic curve*—is dependent upon the smallness of the stricture and atony of the bladder. It is usually a late symptom.

(4) *Dribbling at the end of urination.*—This symptom is common to many urethral conditions, but when associated with gleet it becomes one of considerable diagnostic importance.

(5) *Gleet.*—About 60 per cent. of all cases of stricture are associated with a gleety discharge. It is only seen in the morning as a drop, unless there are acute exacerbations resulting from alcohol or coitus.

(6) *Vague pains* in the back and loins.

Diagnosis.—Strictures are to be diagnosed by exploring the urethra with a bougie à boule. In order, however, to be able to say that a given case has stricture, it is necessary to know what the normal caliber should be for each individual case.

When circumference of penis is	3	in.	urethral caliber	26–28 Fr.
"	"	"	3¼	"	"	28–30 Fr.
"	"	"	3½	"	"	30–32 Fr.
"	"	"	3¾	"	"	32–34 Fr.
"	"	"	4	"	"	34–36 Fr.

After ascertaining the normal caliber of the urethra, when the meatus is preternaturally small, a meatotomy is to be done, a bougie à boule is selected, about five sizes below the approximate normal caliber, oiled, and passed into the bladder. The instrument is now to be withdrawn slowly, and any point at which the shoulder of the instrument seems to stick, is carefully noted. (See *Figure 22.*)

There are three normal points where the instrument may stick: (1) just behind the fossa navicularis, (2) the anterior layer of the triangular ligament going towards the bladder, and (3) the posterior layer of the triangular ligament coming from the bladder. If the first instrument fails to pass through the stricture smaller ones are used, until one will pass to the bladder.

A bougie à boule will show the length of a stricture, its distance from the meatus, its caliber, and often its character (hard or soft).

Treatment.—The treatment of strictures may be considered under the following headings:

(1) Gradual dilatation.

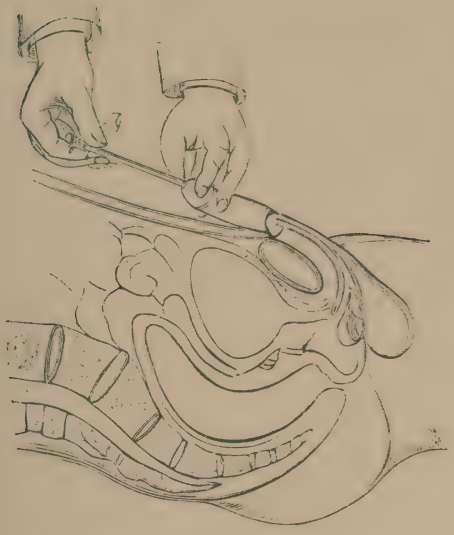
(2) Cutting operations { *a.* External urethrotomy. *b.* Internal urethrotomy. *c.* Perineal section.

(3) Miscellaneous methods (electrolysis and resection).

Gradual Dilatation:—All strictures of large caliber should be dilated by the use of graduated steel sounds, except those situated at or near the meatus. This region is not so dilatable, and being richly supplied with nerves, dilatation is extremely painful. In general, all strictures that can be dilated should be so treated, as it is attended by distinctly less danger than the cutting operations. However, strictures of small caliber are usually old and cartilaginous, and can, therefore, only be dilated with difficulty. (See *Figure 23.*)

Technique of Passing a Sound—The patient should be placed in the recumbent posture, with the legs separated and slightly flexed. The glans penis and meatus should be cleaned with alcohol and then bichloride solution, 1 : 2,000. A steel sound (sterilized) two sizes larger than the caliber of the stricture, is thoroughly lubricated and held in the right hand. The surgeon should stand on the left side of the patient when right-handed, grasp the penis between the thumb and fingers of the left hand. The point of the instrument is introduced into the urethra, the shaft being held in the line of the groin (when abdomen prominent). Allow the point of the instrument to enter the urethra as far as it will go, then sweep the handle to the median line of the abdomen. Gradually elevate the shaft, without force, and place the fingers of the left hand behind the scrotum, so as to guide the point of the instrument through the anterior layer of the triangular ligament. Now grasp the handle of the instrument with the left hand, and with the middle and index fingers of the right hand, press down the structures on either side of the penis, so as to straighten out the curve of the urethra, then slowly depress the shaft between the thighs. If the point of the instrument is in the bladder, the shaft should be in the median line, and the handle towards the toes.

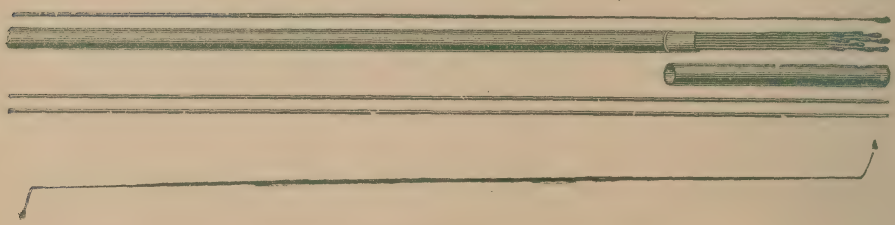
Two or three instruments may be passed at each sitting, at intervals of three or four days, depending upon the effects pro-



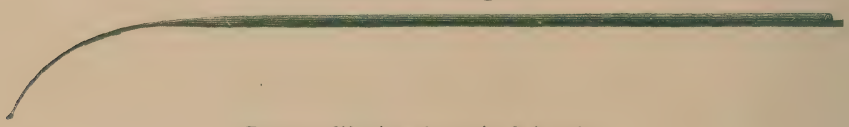
Technique of passing a Sound.

Organic stricture of the Anterior Urethra.

Old No. Fig. 22.
Bougie à boule.

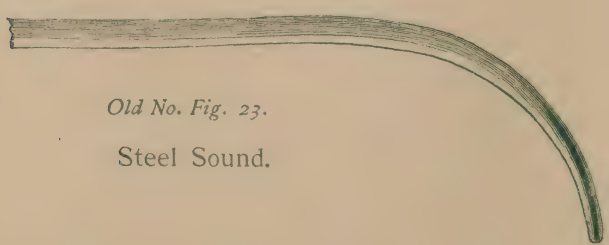


Old No. Fig. 32.
Filliform Bougies.



Bangs dilating bougie à boule.

Otis's Urethrometer and Cover.



Old No. Fig. 23.
Steel Sound.

Meatus Bougie.

duced (inflammatory reaction). In the majority of cases, it is well to follow the introduction of a sound by a urethral irrigation of 1 : 5,000 nitrate of silver solution, and during the entire course of treatment, salol and boracic acid are to be administered by the mouth.

When full caliber is reached, the patient should be instructed to pass an instrument upon himself, and then recommended to use the instrument at intervals of two or three months for life, otherwise, the stricture will probably return.

The cutting operations may be considered under four headings:

Internal Urethrotomy.

The intra-urethral operation for stricture.

Indications.—(1) Strictures of either caliber at the meatus and fossa navicularis.

(2) All strictures of small caliber in advance of the bulbo membraneous junction that cannot be dilated.

Operations.—When the stricture is at the meatus or in the fossa navicularis, a few drops of cocaine are applied and the stricture divided with a blunt-pointed-curved tenotome.

Strictures situated deeper than these points require a urethrotome for division. The patient, whenever possible, should be confined to bed for two or three days before the operation, to permit of a bacteriological examination of the urethra, and a thorough chemical and microscopical examination of the urine. The bowels should be opened daily, and the diet limited to milk. Salol grs. v and boracic acid grs. x should be administered thrice daily.

The operation may be performed under general or local anæthesia.

All instruments should be sterilized by boiling or by immersion in 1–20 carbolic acid solution for one hour, and the urethra should be irrigated with 1 : 5,000 nitrate of silver solution.

The following instruments (urethrotome) are recommended:

(1) White's—cuts from before backwards. (*Figure 24.*)

(2) Gross—cuts from behind forwards. (*Figure 25.*)

(3) Maisonneuve—cuts from before backwards, and also behind forwards. (*Figure 26.*)

(4) Otis—cuts from behind forwards. (*Figure 27.*)

(5) Gerster—cuts from behind forwards. (*Figure 28.*)

The stricture is to be divided in the median line and on the roof of the urethra.

When the stricture is less than 15 French in caliber the Otis or Gerster instruments cannot be used, as it is first necessary to divide the stricture sufficiently, either with a White or Maisonneuve, then the former instruments can be passed through the stricture and the latter divided from behind forwards. The Otis and Gerster instruments must be introduced so that the point is one-half inch behind the stricture, then the blades are separated until the stricture is made tense, and finally the knife pulled through, dividing the urethra from a point one-half inch behind to a point one-half inch in front of the stricture. The blades are now still further separated until the needle on the dial records the proper caliber desired. A full sized steel sound is now introduced, and then the urethra irrigated with 1 : 5,000 nitrate of silver solution.

After Treatment.—The patient should be confined to bed, diet limited to milk. Ten grains of quinine should be administered immediately after the operation, as well as half a drop of aconite every hour for eight doses; then salol and boracic acid should be given three times daily. The urethra may be irrigated daily with 1 : 5,000 permanganate of potassium solution. A full-sized steel sound should be passed every fourth day until cicatrization takes place, and then at longer intervals for life.

Complications of internal urethrotomy:

1. *Hemorrhage.*—Usually free, readily controlled by ice or pressure.

2. *Periurethral Abscess.*—Such a complication is to be avoided by rigid antisepsis of both instruments and urethra.

3. *Urinary Extravasations.*—To be avoided by not dividing the stricture too deeply.

4. *Urethral Fever.*—Can usually be avoided by antisepsis.

5, *Epididymitis.*—Results from the passage of a sound too soon after the operation, from the fourth to the seventh day is sufficiently early.

External Urethrotomy.

Division of a stricture through a perineal incision, a guide being passed through the stricture.

Indications.—Strictures of small caliber at the bulbo-membraneous junction that cannot be dilated.

Internal urethrotomy is occasionally done in this region, but it is extremely liable to be followed by serious or annoying complications, such as perineal abscesses, epididymitis, etc. The bulb of the urethra being more or less dependent when compared with the penile urethra, hence discharge is liable to accumulate here, thus increasing the liability to septic infection.

Operation.—Syme's operation. A Syme's staff should be introduced into the urethra until the shoulder of the instrument is in contact with the anterior face of the stricture. (See *Figure 29.*) The patient is placed in the lithotomy position, the staff held exactly in the median line, with its convexity slightly bulging into the perineum. An incision is made in the median line of the perineum about one and a quarter inches in length, beginning at a point one and a half inches above the anus. This is to be deepened until the knife enters the groove of the staff in front of the stricture, and the latter divided from before backward. A probe-pointed gorget of Teal is introduced into the urethra through the perenial incision (see *Figure 30*), and the staff removed. A full sized steel sound should be passed in order to ascertain whether the stricture has been sufficiently divided or not. The sound is removed and a full-sized Nelaton catheter introduced through the entire urethra until the eye of the instrument is just within the grasp of the vesical neck, and tied in place. The perineal wound should be dressed antiseptically and a T bandage applied. The bladder is to be irrigated daily with boracic acid solution until the third day, when the catheter is to be removed. Nitrate of silver solution 1 : 5,000 is substituted for the boracic acid. At the end of a week a full-sized steel sound is passed and then at intervals of four or five days until the wound is entirely healed.

Perineal Section.

The operation of dividing an impassable stricture of the deep urethra through perineal incision without a guide.

Indication.—Impassable strictures about the bulbo-membranous junction.

Operations.—(1) *Wheelhouse.* (2) *Cock's.*

Wheelhouse Operation.—Place the patient in the lithotomy position, and introduce a Wheelhouse staff down to the stricture with its groove looking towards the operator; then make an incision in the median line of the perineum, opening the urethra at the base of the groove. Now pass two silk threads through the edges of the incised urethra to act as retracters, and at the same time, gently withdraw the staff until the beak appears in the wound (see *Figure 31*); it is then turned round so that the groove looks towards the pelvis, and the hook drawn up into the upper angle of the urethral incision. A strong light is thrown into the interior of the urethra, and a fine probe-pointed director introduced in various directions, and an attempt made to locate the opening of the stricture. If this cannot be found after sufficient exploration (fifteen minutes), the tissues should be carefully incised in the median line, and then the probe tried again. Failing in this a suprapubic cystotomy must be done, an instrument passed from the bladder out (retrograde catheterization), and the perineal incision deepened until the point of this instrument is exposed.

If in the first instance the director can be made to pass through the stricture, the latter is to be divided along the groove of the instrument with a blunt-pointed straight tenotome, both on the floor and roof. A gorget introduced and the stricture still further dilated. The staff is to be removed and a full-sized sound introduced to ascertain if the stricture has been thoroughly divided. All further manipulations are similar to those appropriate for external urethrotomy.

Cock's Operation.—A perineal operation for opening the urethra at the apex of the prostate gland.

Indications.—Impassable strictures of the deep urethra with urgent symptoms, where from the condition of the patient it is

not desirable to subject him to the prolonged operation of perineal section.

Operation.—Place the patient in the lithotomy position, and introduce the index finger of the left hand into the rectum until the apex of the prostate is reached. A double-edged knife is now introduced exactly in the median line of the perineum, and when the point approaches the tip of the finger in the rectum, the handle of the knife is depressed, and the point of the instrument made to enter the urethra at the apex of the prostate. The knife is removed, and a permanent Nelaton catheter introduced, until patient's general condition will permit of the more prolonged operation (perineal section).

Small Deep Strictures.—Strictures of the deep urethra permeable only to filiform bougies. In cases of retention of urine resulting from tight strictures, an attempt should be made to pass a filiform through the stricture. The instrument should be bent at the end because the opening of the stricture is seldom in the centre. (See *Figure 32*). If one fails to pass, a second or third may be tried. Failing in this, a little trick first suggested by White will prove of value: An ordinary blunt-pointed syringe having a capacity of an ounce is filled with carbolized sweet oil. The point of the instrument is inserted in the meatus, and the urethra over-distended with oil. Now if a filiform is introduced while the urethra is still distended, it will often pass easily into the bladder.

If such an instrument can be passed into the bladder, there are four procedures that may be carried out:

1. The filiform may be tied in place; with the certainty that the bladder will empty itself alongside of the instrument.

2. A Gouley's tunneled catheter may be passed over the filiform as a guide, and allowed to remain in place. (See *Figure 33.*)

3. A staff may be introduced over the filiform as a guide and an external urethrotomy done.

4. The filiform may be attached to a Maisonneuve urethrotome and the stricture divided from before backwards.

Urethral Fistulæ.

An abnormal opening, either congenital or acquired, through which the urine escapes from the urethra.

Varieties.—(1) urethro-rectal, (2) urethro-perineal, and (3) urethro-penile.

The urethro-perineal fistulæ is the commonest variety met with.

Causes.—It usually follows a minute rupture of the urethra behind a very tight or impassable stricture, at or about the bulbo-membraneous junction.

Pathology.—As a result of the presence of a tight stricture, the increased force of the stream balloons the urethra behind the stricture, forming a pouch in which a few drops of urine collect. This retained urine undergoes ammoniacal fermentation, and the resulting inflammation produces a superficial desquamation of the cells lining the urethra, and an erosion results. Through this erosion the urine finds its way into the periurethral connective tissue, abscesses form, and burrow down through the perineum, to open on the cutaneous surface in some part of the urethral triangle of the perineum.

Treatment.—If it is possible to dilate the stricture, the fistulous openings often promptly close. Usually, however, it is necessary to do an external urethrotomy, or a perineal section, slit up all the fistulous tracts, pack them with iodoform gauze so that they will heal from the bottom. The after treatment being the same as for the uncomplicated operation for deep stricture.

Urethro-rectal fistula.—A communication between the urethra and rectum.

Causes.—(1) Prostatic abscess, rupturing into the rectum. (2) Ulceration of a prostatic calculus.

Treatment.—The simplest treatment is that of permanent catheterization and repeated cauterization of the fistulous tract. Failing in this the urethra must be opened by a median perineal incision, the thickened walls of the fistulous tract cut away, and a permanent catheter introduced into the bladder through the perineal incision.

Urethro-penile fistula are commonly congenital, although they

may result from the external or internal rupture of a peri-urethral abscess.

Treatment.—Freshen the edges of the fistula, close the urethra with fine catgut sutures, and the skin incision with fine silk. A catheter should be retained in the bladder until healing is complete.

Urethral Fever.

Any fever which follows instrumentation of the urethra.

Varieties.—(1) The reflex. (2) The septic or true variety.

Causes.—Infection through minute wounds and abrasions made by the introduction of instruments.

Symptoms.—The *reflex* variety is usually indicated by a chill, fever and sweat shortly after the passage of an instrument. The chill is pronounced, the fever high, from 104° to 106°, and the sweat copious. There may also be some headache, nausea, pain in the back and vomiting.

The *septic* or true variety usually follows after the first urination, and is ushered in by a similar chill, fever and sweat as in the reflex variety; the fever, however, is a continuous one, with daily remissions almost to the normal. The chills may be repeated several times daily or be limited to one every three or four days. This infection may terminate in the formation of metastatic abscesses as in pyæmia.

Treatment.—Urethral infection is to be prevented, or at least, limited to the minimum, by rigid antisepsis of both instruments and urethra.

If in spite of these precautions, a chill should follow the passage of an instrument give the patient ten grains of quinine, and then a half a drop of aconite every hour for eight doses. When the kidneys fail to act, wet or dry cups may be tried and full doses of tincture of digitalis.

In very grave cases where the amount of septic matter absorbed is great, and the symptoms grow progressively worse, a perineal cystotomy should be performed and a drain (catheter) inserted. The general treatment should be that appropriate for septicæmia and pyæmia.

Cowperitis.

An inflammation of Cowper's glands.

Causes.—Direct infection through the ducts from gonorrhœa of the bulbous urethra. It usually appears about the end of the third week of an acute anterior urethritis.

Symptoms.—Intense perineal pain, caused by pressure (because glands are situated between two layers of the triangular ligament); increased by pressure, sitting or walking. There is pain on urination and pain on defecation. By deep perineal pressure a tumor can often be palpated.

When abscesses form, the symptoms of deep suppuration become manifest. The abscesses may rupture either into the urethra or, as is usually the case into the perineum.

Treatment.—All local urethral treatment should be stopped. The patient should be confined to bed and a ℥ss of sulphate of magnesia administered. Hot fomentations may be applied to the perineum, and morphia may be given in doses sufficient to relieve the pain.

Abscess should be opened through the perineum, and the cavity treated as for abscesses in other regions of the body.

Periurethral Abscess.

The minute glands and follicles scattered along the urethra are particularly predisposed to gonorrhœal infection.

Symptoms.—The symptoms of periurethral abscess are similar to those of any acute abscess.

Treatment.—In the early stages, by gentle massage, the duct may be freed from its plug and the inflammation often subsides.

When signs of suppuration become pronounced the abscess should be opened, curetted and packed with iodoform gauze.

Fistulous openings should be closed by plastic operations.

Chancroid.

A soft chancre is an infectious venereal sore characterized by the absence of constitutional manifestations.

Causes.—A chancroid is the result of infection with micro-organisms. The secretion of the sore is very contagious.

Ducrey has described a short, thick bacillus, with clubbed ends, found in and between the cells, as the specific organism of chancroid. Recently, Lenglet reports the successful cultivation in pure culture of Ducrey's bacillus. In four experimental investigations the same bacillus was found in pure culture. Inoculated into the human subject it yielded positive results, and from the resulting lesions the same bacillus was again successfully cultivated. The organism is a streptobacillus, staining with the ordinary stains, and is decolorized by Gram's method.

Period of Incubation.—Chancroids have no period of incubation, the destructive action of the bacillus begins at once, although the resulting lesion is not apparent until the bacillus has penetrated beneath the epithelial layer. Under some circumstances, the appearance of the ulcer may be delayed for some days.

Varieties.—(1) The *exulcerating*—one which is superficial and saucer-shaped; (2) the *follicular*—one in which the lesion begins in a hair or sebaceous follicle, sometimes called acneiform; (3) the *echthymatous*—one seen on the integument, and is covered with a blackish-green crust; (4) the *ulcus elevatum*—one associated with considerable œdema and cell proliferation; (5) the *serpiginous*—one that has a tendency to spread superficially over a large surface; and (6) the *phagedenic*—one associated with extensive sloughing.

Symptoms.—Chancroid usually begins as a small pustule, which rapidly becomes converted into a ragged, "punched-out" ulcer, with undermined edges. The surface of the ulcer is usually covered by a grayish or brownish slough. In the early stage, the secretion of the chancroid is quite abundant, and consists of a thin, brownish purulent fluid. The ulcers are autoinocuable, that is, they produce similar lesions on surfaces with which they come in contact.

The duration of a chancroid is variable, being influenced by the mode of treatment and the habits of the patient. In general, they may be said to persist for from two to four weeks.

Complications.—(1) *Phimosis*, (2) *paraphimosis*, (3) *lymphangitis*, and (4) *bubo*. Bubo is the most common; in hospital

practice—(as high as 40 per cent.,) while in private practice it is rather uncommon.

Diagnosis.—Chancroid may be mistaken for chancre, herpes, balanitis, ulcerating papular syphilides, gummata, tuberculosis and epithelioma.

Chancre.	Chancroid.	Herpes.
Incubation 10 to 42 days.	None, appear in less than 7 days.	No Incubation.
Single.	Multiple.	Multiple.
Begins as an erosion, papule, or tubercle.	Begins as a pustule and then ulcerates.	Begins as a vesicle, which may ulcerate.
Superficial.	Deep.	Superficial.
Induration.	Slight induration.	No induration.
Scanty secretion.	Profuse secretion.	Scanty secretion.
Not autoinocuable.	Autoinocuable.	Not autoinocuable.
Painless.	Painful.	Extremely painful.
Bubo constant.	Bubo occasionally	Bubo rare.

Treatment.—The principle involved in the treatment of a chancroid is the conversion of a septic ulcer into a simple one.

The glans penis and prepuce should be thoroughly washed with castile soap and warm water twice or three times daily, then peroxide of hydrogen applied, followed by a wash of 1 : 2,500 bichloride solution. After the surface of the ulcer has been thoroughly cleansed and disinfected, powders may be applied, sedative or stimulating, depending upon the variety of chancroid.

℞. Bismuth. subnit.
Acid. boracic.
Amyl . . . āā ʒi
M. S. Dusting powder.

℞. Hydrarg. chlorid. mit.
Pul. opii.
Lycopodii . . āā ʒi
M. S. Use freely.

When this line of treatment fails to bring about a prompt cure, wet dressings may be applied of 1 to 5,000 bichloride, phenol sodique 1 to 5, or lead water and laudanum to which a ʒss of carbolic acid has been added to every six ounces of solution. After the sore has been cleansed, a small piece of absorbent cotton is saturated with the solution, placed over the ulcer, and maintained in place by drawing the prepuce forward

over the glans. When the prepuce is too short, a bandage may be used.

Various antiseptic ointments composed of copper, iodoform and zinc have been recommended, but present no advantages.

A phagedenic or serpiginous chancroid should be cauterized with pure carbolic acid, acid nitrate of mercury, or pure nitric acid, and then, after the slough separates, treat as a simple ulcer.

The objections to the routine cauterization of chancroids are, that it does not remove the infection, and usually converts an open into a concealed sore by excessive inflammatory œdema (phimosis).

In subpreputial chancroids or concealed sores the cleansing must be carried out by a syringe with a long, flat nozzle, gently inserted beneath the prepuce and the cleansing solutions allowed to flow out between the prepuce and the glans penis. In the interval the entire penis should be surrounded by lead water and laudanum solution.

When concealed sores threaten to destroy the penis, the prepuce must be split up on the dorsum, or a formal circumcision performed. The danger of performing circumcisions under these circumstances is the likelihood of infecting the entire raw surface incident to the operation with the chancroidal virus. However, in a fair proportion of cases, when every antiseptic precaution has been taken, primary union results.

Syphilis.

An infectious venereal disease of chronic course, communicated from person to person by actual contact with discharges containing the virus, or by heredity.

Causes.—Syphilis is almost certainly due to the presence in the system of a specific micro-organism, as clinical evidence will clearly demonstrate. The presence of such an organism, however, is still entirely hypothetical. The alleged bacillus of Lustgarten has never been isolated, cultivated artificially, or subjected to inoculation experiments. Van Niessen claims to have cultivated artificially his streptobacillus, but as yet, no inoculating experiments have been made.

Methods of Infection.—(1) *Direct contact*—sexual inter-

course, kissing, etc.; (2) *Mediate infection*—instruments, drinking glasses, towels, etc.; (3) *Hereditary transmission.*

The physiological secretions of syphilitics (saliva, sweat, milk and semen), do not of themselves contain any virulent principle, but they may be contaminated by admixture of the secretions of the secondary lesions (mucous patch).

Periods of Syphilis.—There are six periods of syphilis divided in accordance with its clinical course:

(1) *Primary incubation*—the time elapsing between exposure to the contagion and the appearance of the sore.

(2) *Primary symptoms.*—Includes the chancre and adenitis.

(3) *Secondary incubation.*—The time elapsing between the appearance of the chancre and the development of secondary lesions.

(4) *Secondary symptoms.*—Includes fever, alopecia, and the skin eruptions.

(5) *Intermediate period.*—The time which elapses between the disappearance of the secondary lesions and the appearance of the tertiary lesions.

(6) *Tertiary symptoms.*—Includes the gumma and bone diseases.

Chancre.—Chancre is the primary lesion of syphilis and always appears at the point of inoculation.

Period of Incubation.—The first period of incubation varies in length from ten days to forty-two days, and in exceptional cases from sixty to seventy days.

Varieties.—(1) *The chancrous erosion* appears as a sharply defined, excoriated spot of dull red or coppery color.

(2) *The "silvery spot"* appears on the surface of the glans and the lips of the meatus, suggesting the appearance produced by touching a mucous surface with carbolic acid or nitrate of silver.

(3) *The dry papule*—found on exposed surfaces and appearing as a hard, raised, dark colored tubercle.

(4) *The follicular chancre* begins as a small pinkish papule with a minute depression in the centre.

(5) *The necrotic nodule*, beginning first as a papule, often

reaching the size of a pea; it then breaks down with the formation of a purplish colored slough.

(6) *The echthymatous chancre*—one that becomes covered with crusts.

Clinical Characteristics.—The clinical characteristics of a typical or Hunterian chancre are as follows:

It begins as a superficial papule extending in circumference and depth, followed by redness and desquamation of the epidermis.

The induration begins at the end of the first week, and becomes pronounced at the end of the second week. It is cup-shaped on top, occasionally covered with a false membrane, above the level of the surrounding tissue, not autoinocuable, usually single, and generally heals spontaneously.

Seats of Chancre.—A chancre may be located in any part of the body, the great majority, however, are situated upon the genitalia. Extra-genital chancres are found on the lips, in the mouth, about the anus, and in the region of the nipple.

Pathology.—The organisms are deposited in some minute crack or tear and slowly begin to proliferate. As the infection advances, inflammatory changes follow depending in extent upon the nature of the tissue involved. These inflammatory changes consist in a more or less extensive round-celled infiltration of the connective tissue spaces. The arterioles and venules undergo sclerotic changes, especially in the adventitia, and with the inflammatory changes described above, give the sore its characteristic induration. The sclerosed blood vessels being unable to supply the nourishment necessary for the vitality of the tissue, a small superficial slough forms, and cause the cup-shaped depression.

Induration.—The induration becomes perceptible during the first week or ten days, and reaches its height about the end of the second week.

Causes.—Rounded cell—infiltration of the connective tissue spaces with the sclerosis of the arterioles and venules. The induration is in proportion to the amount of connective tissue and the blood supply.

Varieties.—(1) *Laminated*—sclerosis limited to the papilli;

(2) *parchment*—somewhat deeper sclerosis than the laminated, and as a consequence, feels thicker; (3) *nodular*—sclerosis of the cutaneous and subcutaneous vessels; and (4) *annular*—sclerosis is limited to the margin of the sore, a hard ring being formed. The induration usually begins to disappear about the end of six weeks; it may, however, last for years.

Diagnosis.—A chancre must be distinguished from chancroid and herpes, and when situated in the urethra, from gonorrhœa.

Urethral Chancre. Incubation Ten to Fifty-two Days.	**Gonorrhœa.** Incubation Three to Five Days.
Always situated within the first half inch of the urethra.	Involves the entire urethra.
No chordee.	Chordee marked.
Ardor urinæ limited to the chancrous area.	Ardor urinæ involves the entire urethra.
Scanty discharge.	Profuse discharge.
Induration	No induration.
There may be some obstruction to the flow of urine.	Obstruction rare, except in inflammatory stricture.
Absence of gonococci.	Gonococci present.
Syphilitic bubo.	Inflammatory bubo.

Treatment.—The *abortive* methods include excision, cauterization, and the subcutaneous injections of corrosive sublimate solution about the sore. In every authentic case the above methods of treatment have been followed by the appearance of secondary lesions. Excision is to be recommended when the sore is so situated that it would be removed by a formal circumcision.

The *palliative* treatment consists in the thorough cleansing of the sore with soap and hot water, spraying with peroxide of hydrogen, irrigation with 1:3,000 bichloride solution, and the use of the following dusting powder:

℞. Bismuth. subnit. . . .
Acid. boracic. . . .
Iodoform. . . . āā ʒi

Occasionally a chancre may take on an excessive inflammatory reaction, the result of infection with other varieties of microbes, and may then require treatment appropriate for chancroid.

Lymphatics of the Genito-Urinary tract.

Syphilitic Adenopathy.—Immediately following the appearance of the chancre the lymphatic vessels become involved, and the glands draining the diseased area become enlarged. This enlargement is sometimes appreciable as early as the fifth day, but as a rule, it is not marked until about the tenth or fourteenth day.

Clinical Characteristics of Syphilitic Buboes.—Syphilitic buboes possess the following characteristics:—(1) They are polyganglionic, (2) usually painless, (3) non-adherent to the skin, (4) non-inflammatory, (5) seldom or never suppurating. When suppuration does take place, it is the result of a mixed infection with pyogenic organisms.

Within six weeks after the appearance of the chancre, all the lymphatic glands of the body become enlarged.

Route of the infection of the lymphatic glands:

(1) Chancre situated about the glans penis.
(2) Infection of the dorsal lymphatics of the penis.
(3) Enlargement of the superficial inguinal glands.
(4) Enlargement of the external iliac glands.
(5) Enlargement of the internal iliac glands.
(6) Receptaculum chyli.
(7) Thoracic duct.
(8) Left subclavian vein, and then enters the blood.

Secondary Syphilis.—About six weeks after the appearance of the chancre the period of secondary syphilis begins. It is usually ushered in by fever of a 100°–101°, vague rheumatic pains, sore throat, general malaise, and alopecia of the entire body.

Syphilitic Alopecia.—Syphilitic alopecia is seen best on the sides of the scalp having the general appearance of being moth-eaten, a fact which distinguishes it from ordinary baldness. It is caused by a sclerosis about the hair follicles, which destroying the blood supply causes the hair to die and fall out. The hair, however, will return when appropriate internal treatment is instituted.

Immediately following these prodromes, the skin eruptions make their appearance.

Classification of cutaneous syphilides:

(1) *Erythemas* — (*a*) Erythema. (*b*) Macules. (*c*) Roseola. — all early eruptions.

(2) *Papules*
- (*a*) Conical or miliary
  - (1) Large.
  - (2) Small.
- (*b*) Lenticulo-papular.
- (*c*) Small flat papular.
- (*d*) Large flat papular.
- (*e*) Papulo-squamous.
- (*f*) Lichen-like.

(3) *Pustular*
- (*a*) Acneiform.
- (*b*) Variloform.
- (*c*) Impetigo.
- (*d*) Echthyma.
- (*e*) Rupia.

(4) *Gummata*
- (*a*) Gumma.
- (*b*) Tubercle.

Erethymatous Syphilide.—This is usually the earliest syphilitic eruption. It first appears as irregularly distributed round or oval stains, becoming more pronounced by exposure to cold, at first disappearing on pressure (later not), and lasting from ten to fourteen days.

At the end of ten or fourteen days the indistinct stains of the erythematous period become more pronounced, slightly elevated, and do not disappear on pressure (papules).

Papular Syphilide.—The papules may be either large or small, smooth or scaly depending upon the blood supply and the anatomical peculiarities of the tissues. When situated upon the palms of the hand the eruption will be of the papulo-squamous variety.

A papule by friction, heat, and moisture, may lose its superficial layer of epithelium and become converted into an eroded surface. It then receives the name of *mucous patch.*

Mucous patches are usually found under the arms, in the

mouth and pharynx, and around the genitals. When subjected to irritation, an overgrowth of the papillary layer follows, and a *condyloma* results. Mucous patches are the most contagious of all lesions of syphilis.

Pustular Syphilide.—Syphilitic pustules may be either large or small and appear either early or late.

The small pustular variety attacks the hair and sebaceous follicles and may be transformed into small ulcers. The large pustular form has a tendency to involve large areas of tissue and is usually found on the hairy parts.

Echthyma may be either superficial or deep, the former usually appearing on the lower extremities as very large pustules covered with a thick dark crust. When such lesions heal, they leave a dark brown, copper stain, which gradually becomes whiter as the scar contracts.

The deep form is characterized by the formation of more or less deep ulcers which are covered with greenish or brownish imbricated crusts.

Rupia appears as a large elevation of the epidermis, filled with blood-stained serum which soon becomes purulent. The bleb bursts and some of the fluid escapes, and as it dries, is covered with a crust, which accumulating new layers becomes imbricated, forming greenish brown cone shaped scabs. Beneath the crust suppuration extends to the papillary layer.

The *tubercles* and *gummata* belong to the late manifestations of secondaries. Tubercular syphilide consists of diffuse and circumscribed infiltrations involving the entire thickness of the skin. There are two varieties, the ulcerating and the non-ulcerating. They may be isolated or in groups, and healing is attended with the production of a pigmented cicatrix.

The *gumma* is a typical lesion of tertiary syphilis. In the late stage of syphilis the lymph channels become blocked with the broken down products of the secondary stage, as a result of blocking of these spaces, inflammation develops, and a sharply, circumscribed tumor forms. The favorite localities are the face, scalp, shoulders, neck, arms, thighs and legs. After a time owing to the imperfect organization, the gumma softens, breaks down, and discharges its contents (gummy pus).

Clinical Characteristics of the Skin Eruptions.—They are (1) *polymorphous*—tissues involved, blood supply, chronic course of the disease, and the tendency to relapse; (2) *crescentic*—anatomical arrangement of the capillaries; (3) *copper colored*—coloring matter of the blood leaks out owing to the pressure of the sclerosis; (4) *non-itching*—so chronic that they do not irritate the skin; (5) *symmetrical*—because it is a blood disease; (6) cicatrices are first pigmented, and then grow white with age.

Tertiary Syphilis.—When syphilis does not become extinct in the secondary stage, it passes into a chronic state called tertiary syphilis. It differs from secondary syphilis in the fact that the lesions are deep and run a long, indolent and a phlegmatic course, with a decided tendency towards the over-growth of connective tissue.

Symptoms.—(1) Gummata in various parts of the body.

(2) *Bone diseases*
- (*a*) Osteo-periostitis.
- (*b*) Rarefying osteitis.
- (*c*) Gummatous osteomyelitis.

(3) *Disease of the nervous system*
- (*a*) Meningitis.
- (*b*) Gummata
  - large on surface of brain;
  - small, following the middle cerebral artery.

Treatment of Syphilis.—Never begin the use of drugs until the appearance of some characteristic lesion at a distance from the sore, because it is impossible to diagnose syphilis from the sore alone.

There are three exceptions to this rule: (1) *Confrontation*—when it is possible to examine the person from whom the disease was contracted, then the presence of a typical sore with active syphilis in the party from whom the disease was contracted, indicates immediate treatment.

(2) The presence of a typical sore in a prominent place—as the lip.

(3) Typical sores in the mouth—liable to infect other members of the family.

The routine treatment, therefore, consists in waiting for the development of the post-cervical enlargement, and then the admin-

istration of the protiodide of mercury in ascending doses. Mercury is indicated in the treatment of syphilis because of its probable germicidal action in constitutional microbic infections, and because of its power to destroy the extensive round-celled infiltration.

℞. Hydrarg. protiodid. . . . ℈i
Confect. rosæ . . q. s.
M. ft. pil. No. Lx.
S. One t. i. d. p. c.. as directed.

The patient is directed to begin with one pill three times daily and to increase one pill each day until the premonitory symptoms of ptyalism are produced (fetor of breath, tenderness when the teeth are knocked together, and ropy saliva). Mercury is given in ascending doses in order to ascertain the physiological limit for each particular case, once knowing this, the dose is so regulated as to just keep within bounds, that is, to get the beneficial effects without the poisonous. The dose is then cut down half when a large number of pills is taken or one-third when a small number is taken. The mercury in some form is to be continued for eighteen months or two years. At the end of this time the biniodide of mercury should be administered in doses of one-twelfth of a grain three times daily, with twenty grains of iodide of potash, and continued for six months.

℞ Potassii iodidi . . . ʒss
Aquæ q. s. ad. . . . fʒss
M. S. Gtts. xx t. i. d. p. c.

If at any time during the six months' mixed treatment secondaries reappear, the mixed treatment must still be continued six months from the time of reappearance.

Iodide of potash should never be given *in the secondary* stage of syphilis, unless the disease is of a *malignant nature*, and the deeper or fibrous structures are attacked.

Methods of Administering Mercury:

(1) *By the mouth*—the protiodide in doses of one-third of a grain, bichloride in doses of one-twentieth of a grain to be used when the green iodide is not well borne, and mercury with chalk to be used when the other forms of the drug produce gastro-

intestinal symptoms with diarrhœa. The dose is half a grain, to be gradually increased, as in the case of the green iodide.

(2) *Inunctions*—To be recommended when the internal administration of mercury is followed by severe gastro-intestinal irritation.

Method.—The patient should take a warm bath, dry the skin and then rub in ʒi of the ointment of mercury for twenty minutes on the non-hairy surfaces. Such treatment to be repeated daily. The body should be divided into six parts, and the different parts used in succession so that the same part is only used once in every seven days. By following some such rule you will avoid the cutaneous irritating effects of the mercurial ointment, and by avoiding the hairy surfaces, troublesome eczema and acneiform sores will be prevented.

(3) *Vaporization* is to be used in cases of malignant syphilis, where the general health of the patient is seriously affected, so that the internal use of mercury is not to be considered. In these cases the cutaneous surface is usually covered with an extensive eruption so that inunctions cannot be used.

Method.—The patient, naked, should sit on a cane seat chair and cover himself (all but the head) with a mackintosh. Underneath the chair an iron pan should be placed over an alcohol lamp, and ʒi of calomel vaporized. In twenty minutes the lamp should be extinguished, but the patient should remain exposed to the fumes for twenty minutes longer.

(4) *Baths* to be recommended where there are wide-spread pustular lesions. The strength should be 1 : 20,000 of bichloride, and at a temperature of 80 to 85°.

(5) *Hypodermics.*—Bichloride, calomel, or gray oil. These should be employed when other methods of treatment fail, or when a very rapid effect is desired. It should be remembered that this method of treatment is extremely painful, and that the injections are frequently followed by abscesses and deep sloughing.

The dose of mercury should always be temporarily raised when new symptoms make their appearance.

During the mercurial treatment, the general health of the patient must be carefully regulated, everything may be recom-

mended which will increase the patient's weight. In general the use of alcohol should be eschewed, unless the patient's weight is increased thereby. The teeth should be kept in order and be kept scrupulously clean by the use of antiseptic washes, the gums should be hardened by the use of astringent and antiseptic mouth-washes. Whenever possible, smoking is to be avoided. The gastro-intestinal tract should be kept free from irritation by the regulation of the diet and the avoidance of constipation.

The patient should also be warned as to the contagiousness of his disease and be informed as to the methods of avoiding the inoculations of friends or family.

The local treatment of syphilis is subservient to the constitutional, but the healing of ulcers may be hastened by local applications.

Mucous Patches.—These can often be prevented in the mouth by attention to the general rules of cleanliness. When they appear they should be touched with either a solution of copper sulphate grs. v to ʒi, or nitrate of silver grs. xv to ʒi, and the following mixture may be recommended as a mouth wash:

(White) ℞. Acid. boracic. . . . .
Acid. tannic . . . . āāʊii
Mel. rosæ . . . . fʒii
Aquæ . . . . . fʒvi
M. S. Use as a mouth wash.

When situated on the cutaneous surface the following dusting powder may be applied:

℞. Bismuth. subnit. . . .
Calomel . . . .
Lycopodii . . . . āāʒi

Condylomata when exuberant should be cauterized with pure nitric acid and the above dusting powder freely applied.

The pustular eruptions are often greatly benefited by mercurial baths and vaporization. When the ulcers are indurated and covered with crusts the following may be applied:

℞. Ung. hydrarg. nit. . . ʒi
Ung. petroleii . . . ʒi
M. S. Apply locally.

Gummata, periosteal nodes, and tubercular syphilides non-ulcerating are to be treated by the use of the following:

℞. Ung. hydrarg. . . .
Ung. belladonna. . . āā ʒii
Ung. iodi. comp. . . . ʒi
Ung. petroleii . . . ʒii

M. S.—Spread on a piece of lint, and keep in place by a bandage.

Tertiary Syphilis.—In the treatment of tertiary syphilis it is necessary to administer a remedy that will remove the broken down products of the secondary stages from the lymphatic system. For this pupose iodine is administered in some form, and is to be pushed until some effect is produced on the lesions. It is customary to combine small doses of mercury or make use of inunctions in the treatment of the tertiary lesions.

℞. Potassii iodidi . . ʒss
Aquæ q. s. ad. . . fʒss
M. S. Gtts xx t. i. d. p. c.

℞. Pil. hydrarg. biniodid. gr. 1/12
No. XX
S. One t. i. d. p. c.

Hereditary Syphilis.—Syphilis is readily transmissible to the embryo as an active contagious disease, and differs only from acquired syphilis in that it is not preceded by the usual primary sore or chancre.

Routes of infection:

Husband may infect the wife { (1) By direct contagion. (2) Through the child.

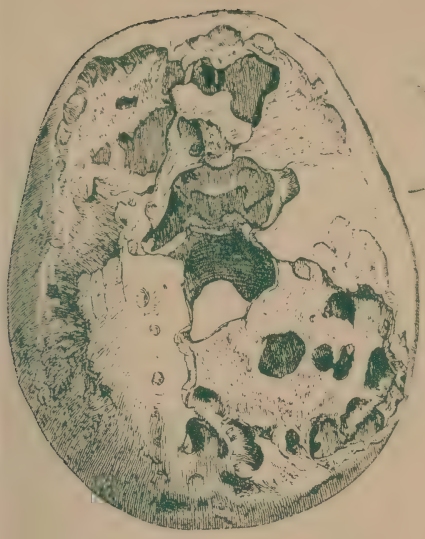
Child may be infected:

(1) From father { (*a*) Previous to conception. (*b*) At the moment of conception.
(2) From mother { (*c*) During utero-gestation.
(3) By direct infection during birth.

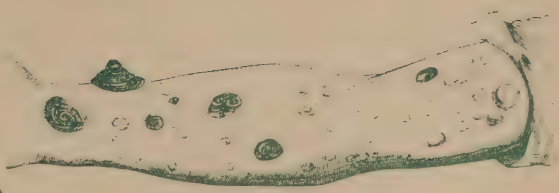
Colles's Law.—A mother may give birth to a syphilitic child, nurse that child, and remain immune to syphilis.

Profeta's Law.—A syphilitic mother may give birth to a child, nurse that child, and the child remain immune to syphilis.

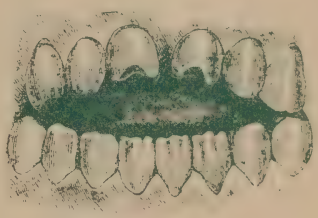
Syphilitic women frequently abort. This is due to an overgrowth of connective tissue in the placenta. The first abortion usually occurs at the third month, each succeeding pregnancy aborting later and later.



Syphilitic Caries of skull.



Rupia



Hutchinson Teeth.

Syphilitic Condylomata.

Symptoms.—The primary stage or chancre is never present in hereditary syphilis. Secondaries make their appearance from one to three weeks after the birth of the child.

At birth, the child presents a senile, weazened appearance with a characteristic hoarse cry, ulceration of laryngeal mucous membrane, snuffles, and pemphigus of the palms of the hand and the soles of the feet. At the end of the second or third week, the various skin eruptions make their appearance. The first teeth are irregularly developed, opaque, chalky, appear somewhat later than usual, and decay early.

At the end of eighteen months or two years, an intermediate period begins, and extends up to the time of the second dentition or puberty. It is characterized by the absence of special symptoms, although evidences of the existing diathesis still persist.

The tertiary symptoms follow this intermediate period, and are especially noticeable about puberty. The characteristic symptoms of the tertiary period are: The *Hutchinson Teeth* (thick and notched central incisors), stunted growth, sunken nasal bridge, caries of various bones, interstitial keratitis, rhagades (linear scars about the mouth), ulceration of the hard palate, and periosteal nodes.

Treatment.—At birth ʒss of the following ointment should be spread daily upon the binder:

℞. Ung. hydrarg. . . . ʒss
Petrolat. . . . . ʒss
M. S. Apply as directed.

If the skin becomes irritable, give the following:

℞. Hydrarg. cum cretæ grs. iii. to vi
Sacch. alb. . . grs. xii
M. Ft. chart. No. xii. S. One after nursing.

At puberty, treatment appropriate for tertiaries in the acquired form is indicated, with the addition of cod liver oil and iron.

For the treatment of bone diseases see special operations.

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